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ABSTRACT

The papers presented in this monograph address a number of concerns in developing a pedagogical approach for gifted and talented children. In the first paper, it is noted that routine intelligence tests cannot be relied upon to identify the gifted, and that a more stringent case study approach should be adopted to take into account the particular gifts and talents that students may have. In the second paper, educators are encouraged to recognize the inherently complex problem of developing a curriculum adapted to the unique cognitive styles of gifted children. The third paper explores the problem of math avoidance on the part of gifted girls. Research on a counseling program to meet the particular needs of gifted children is described in the fourth paper. The fifth paper deals with building an agenda for gifted programs that is based on a recognition of the psychosocial needs and cognitive abilities of talented students. (JD)

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Research and Issues in Gifted and Talented Education

IMPLICATIONS FOR TEACHER EDUCATION

William R. Miles, ed.

SP 017 369

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RESEARCH AND ISSUES IN GIFTED AND TALENTED EDUCATION:

IMPLICATIONS FOR TEACHER EDUCATION

William R. Miles, editor

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FOREWORD

In an era dedicated to equal opportunity to realize one's potential, it is too often forgotten that all students must be offered this opportunity. The physically and mentally handicapped, those whose home environments have been deficient in the fostering of intellectual skills, and those whose ethnic backgrounds differ from the majority ethos of American society--all these have a right to develop to their full potential. Much has been written on the topic of improving the possibilities for full growth for these populations. However, one group which frequently tends to be overlooked in this push for equal opportunity is "the gifted."

In this series of papers, edited by William R. Miles of Western Washington University, Bellingham, a number of concerns in developing an pedagogical approach to the gifted are addressed. Maurice Freehill discusses the important role of the classroom teacher in recognizing giftedness in students. Meredith Olson investigates ways in which giftedness affects (or should affect) the ways in which curricula are developed and carried out. Nancy Cook examines prevailing social attitudes toward female students and excellence in mathematics, and makes cogent arguments as to how these attitudes affect the realization of female potential in this field. Marshall Sanborn, while noting the frequent similarity between needs of gifted students and those of their peers, stresses that in some ways their needs are peculiar to their class as gifted individuals and should be addressed in specialized ways. Robert Smith identifies groups having legitimate interest in developing goals, programs and evaluation procedures for gifted students and observes that such groups should play a part in these processes.

The ERIC Clearinghouse on Teacher Education is pleased to offer this collection of papers for the stimulation of thought and discussion concerning opportunities for gifted children, and hopes that it will support practice in the realization of gifted potential. The Clearinghouse would like to acknowledge the assistance of the ERIC Clearinghouse on Counseling and Personnel Services and the Clearinghouse on Handicapped and Gifted Children for their assistance in the development of this product. In particular, the perseverance, able mind, and sharp pencil of Sharon G. Boardman, Clearinghouse editor, are responsible for this contribution to the professional literature.

MICHAEL J. BUTLER
Associate Director
ERIC/Teacher Education

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RESEARCH AND ISSUES IN GIFTED AND TALENTED EDUCATION:

IMPLICATIONS FOR TEACHER EDUCATION

by William R. Miles

Gifted education becomes important to teacher education when increased attention, monies, and/or jobs in the public schools create demands for teachers and programs for the gifted, or when state certification requirements mandate certain programs of study. Five states--Georgia, Kansas, New Mexico, North Carolina, and West Virginia--require certification in teaching gifted children.

From the late 1970s to the present, educators have witnessed and will see more attention and money going to gifted education. The variety of reasons are too numerous to discuss in detail. In general, some people have attached gifted education to historical epochs corresponding to troubled times nationally and internationally. These troubling conditions, as in the post-Sputnik period, lead to the question, What is education doing to prepare the best and brightest children? Others trace concerns for individualized instruction and the deemphasis on egalitarianism to a renewed concern for gifted and talented students. Still others more cynically hold that with continued inflation and Federal tax surpluses, coupled with changes in gifted and talented bureau funding, the economic situation is ripe for renewed monies in this area. Nationally as well as in the northwest, an upsurge of interest in gifted and talented education can be seen through increased Federal and state opportunities for funding, media coverage, and parent expectations.

Teacher education must respond to the demand. This introductory chapter was written to discuss the implications of gifted education and to preview the remaining chapters in the monograph. The following sections examine where and how, who, and what should be the substance of that response with respect to college preparation and inservice training.

Where and How?

Where should teachers receive their training in the teaching of gifted students, and how should that training be organized? With only eight states requiring certification, teachers of the gifted are relatively free to pick and choose their training. Should that training be theory based in college courses, mandate a practicum for working with gifted children, or be practically oriented in local inservice efforts? Or should the training combine all three? In the past, training has occurred in typical patterns.

Summer Institutes. Short courses or collections of short courses, typically lasting four to six weeks during the summer, are oriented around the topics of curriculum or psychology of the gifted. Sometimes these topics are augmented by demonstration classes with gifted children. Summer institutes attract teachers primarily because the courses are specific to the topic, they are short, and they convene during the summer.

In an analysis of models for training teachers for gifted education, Maker (1975) described three characteristics of good summer institutes, as indicated in the dissertation research by Koonanjian. Teachers first should undergo a variety of self-assessments about the topic at hand by measuring their attitudes, skills, and knowledge in the area. They should engage in self-diagnosis by using self-scored diagnostic tests related to the concepts and skills that are the skeleton of a summer program.

Teachers typically criticize summer institutes for being too "theory" oriented and containing too little information that they can use when they return to their classrooms. However, summer institutes that follow Maker's three precepts appear to be using a good model for self-diagnosis and internalization. For example, the National/State Leadership Training Institute in Ventura, California, has run several summer institutes with no college affiliations. The Institute brings in practitioners and theoreticians to provide an appropriate mix of experiences. Its model for gifted education rests heavily on extensive planning by the subpublics involved in the state or school district. The Institute considers such involvement to be a necessity for success.

Demonstration Centers. Exemplary programs of gifted education as determined by the National Diffusion Network, pilot programs, or centers for large school districts are forms of the demonstration model. Teachers' centers also might come under this category. This kind of approach relies on the need to satisfy most teachers' "come and see" attitude. For example, teachers may not readily believe that science can be taught according to Bloom's high levels of cognitive taxonomy (Bloom and Krathwohl 1977), or that social studies can be taught as problem solving until they have seen other teachers do these things.

In the latest issue of Educational Programs That Work, three gifted programs were announced for dissemination throughout the country. These programs originated in local school districts and usually subsisted on funding for innovative programs from Title IV-C of the Elementary and Secondary Education Act. After a rigorous evaluation, programs were deemed valid for national dissemination. Of the 113 programs brought up for validation in 1979, only 13 received it. In addition to the information and materials disseminated, these exemplary programs are open to visitors and attract up to 3,000 educators a year.

The key to a successful demonstration program is that educators see an effective program at work with experienced teachers. However, endemic in this kind of experience is that a viewer can come away thinking that gifted education consists of that limited experience, rather than seeing the range of possible experiences that might be included.

Area Service Centers. Whether they are called area service centers in Illinois, educational service districts (ESDs) in Washington, cooperative educational service agencies (CESAs) in Wisconsin, or boards of cooperative educational services (BOCES) in New York, these intermediary school agencies typically serve a training and inservice function for collections of several

school districts, especially the smaller ones. Small school districts can band together to obtain teaching services for gifted children, which otherwise would be prohibitive if they had to support them alone. They also can obtain more sophisticated diagnostic services for identifying children through the evaluation services of an intermediary unit.

Area service centers are limited by the collective knowledge and experience of the people in them. For example, if service center staff conceive of gifted education as enrichment only through separate special classes, the predominant model of teacher education will carry that stamp. If they view teacher identification as the primary means of student identification, this too will dominate their efforts in training teachers. Teachers gleaning their experience through area service centers seldom will obtain the global understanding of the issues and concepts in the field.

Colleges and Universities. Finally, in the where and how of teacher training, colleges and universities offer gifted education in their baccalaureate teacher education programs, fifth year courses, and postgraduate training. Colleges of education also offer summer training institutes. The offerings typically lead to certification, but often courses are an afterthought, rather than a feature of, an undergraduate's already packed schedule of courses.

In a 1972 survey by Laird and Kowalski, colleges and universities with enrollments of 500 or more were surveyed on their course offerings in gifted education. Thirteen percent had actual programs or courses, and several mentioned that they would like to do more in the area (Maker 1975, p. 19).

In a typical university it is never quite clear in which department gifted and talented education should be housed. A recent trend is moving toward making it part of special education, but psychology or educational psychology faculties often show a predilection toward gifted education as a field of study. Also, "regular" elementary education professors have recently taken an interest in the field and have attempted to bring to teacher training such courses as "higher level thinking" or practicums with gifted students.

Who?

The debate of who should teach teachers about gifted education centers on the tension between theory and practice, between college professors and practitioners, and between interests in the development of the field in general and in the application of training to Monday's classes. Teachers are notoriously oriented toward practical application and they want training to be delivered in ways that make it easily transferable to their class work

The ideal resume of a teacher of teachers of gifted education would include elementary and perhaps secondary teaching experience--experience in starting up, teaching in, and evaluating a gifted program; a doctorate in educational psychology with a specialization in gifted education; and curriculum writing experience. The actual teaching experience would give a needed credibility with regular classroom teachers. The experience in starting a program would be invaluable to initiates in a training program. The experience of teaching in a program would allow an instructor to talk about what went right and wrong, and how both unintended consequences as well as intended goals were handled. The experience in evaluating a program would help the trainees understand the rigor needed and terminology necessary to prove that programs are effective and make a difference. A doctorate would

indicate depth and breadth to the overall understanding of gifted education. Finally, curriculum writing would be an obvious aid in helping teachers through that required experience.

Numerous trade-offs are made to get trainers of teachers in gifted education. Too often, staff development sessions consist of glowing descriptions of the teacher of the gifted in some school district. Teachers learn how this one individual set up daily and weekly lesson schedules, organized classroom materials, etc., but they leave the session without understanding the rationale, the underlying precepts, or the alternative goals and methods of gifted education. In turn, teachers quickly tune out the college professor who lectures by the book and has little practical knowledge of daily happenings. For example, the professor might have unlimited knowledge on how left and right hemispheric balance research may affect education in the next 20 years, but this information has no applicable value.

The issue of who should conduct teacher training is all the more acute because it is directly related to what should occur with gifted children, how it should occur, and who should deliver the service.

What?

The curriculum, the substance, and the knowledge, skills, and concepts included in teacher training for gifted education are essential for understanding the field. Typically, college sequences in gifted education include a course in curriculum, psychology, and teaching methodology for the gifted. Also in the What category are one-shot inservice sessions, which often rest on "how I do it at X school," as discussed.

In college courses, concepts for gifted education are too often organized on an historical continuum. In a class on curriculum for the gifted, for example, one might learn about the history of acceleration in the 1930s, the Cleveland enrichment efforts after World War II, acceleration in the 1950s with never enough time spent on trends, emerging concepts for the 1980s and beyond. This is true also in psychology of the gifted courses taught from an historical point of view. An understanding of past developments is important not so much for the knowledge itself, but for how it bears on the present and the future.

Gallagher's (1975) text on teaching the gifted is excellent in that it displays several approaches and concepts rather than boring one with history. Correll's (1978) monograph in the Phi Delta Kappa Fastback series likewise concentrates on goal sets and approaches rather than history. Whitmore's (1980) recently published book on gifted children who are underachievers spends only one of five parts on the historical perspective of gifted education.

The one-shot inservice session, which has been criticized at length, should be compared to the planning approach at the National/State Leadership Teaching Institute in Ventura, California. The Institute mandates that a cross-sectional team of administrators and teachers commit a certain number of days to plan for goals, teaching, and evaluation. Presentors include people like Sandra Kaplan who can both speak knowledgeably on subjects such as goals for the gifted and also display teacher materials for classroom use on the basis of that lecture. The Institute's planning approach is commendable as an overall change strategy instead of a quick fix or bandage approach.

Other exemplary collections of materials (see references for complete citation) include Star Power (Priem 1979), Conn-Cept (Vassar 1979), University

of Wisconsin materials (Clausen 1976), and the Northwest Lab's WESTCO (O'Connell 1980) materials. Star Power, a collection of 10 modules put out by the Educational Service Center in Austin, Texas, seems encyclopedic in its approach to the subject. The state of Connecticut publishes an excellent newsletter along with other materials collected under the label Conn-Cept, which bear the influence of Joseph Renzulli at the University of Connecticut and his enrichment triad model. The extension cooperative and the University of Wisconsin offers a semester-long television course (13 half-hour sessions with lesson and readings included). Although the course needs to be augmented by differential experiences, it is a useful compendium of trends and issues. Carleen O'Connell at the Northwest Regional Educational Laboratory in Portland, Oregon, has produced a set of inservice training materials for a consortium of educators in California, Oregon, and Washington. The Lab is known to produce excellent materials and has access to the best in research and production staffs.

Finally, for the what of teacher training of the gifted, the state of North Carolina under the direction of Dorothy Sisk has compiled a list of teaching competencies (Fisher 1974). This work should provide a useful framework for organizing sets of courses and experiences.

Monograph Introduction and Overview

In the spring of 1980, the Washington Educational Research Association and the Northwest Gifted Child Association held a joint conference in Seattle, Washington, entitled "Research and Issues in Gifted and Talented Education." The planning committee for that conference invited six people to speak and submit papers of their presentations for this publication. Of the six, Jacob Getzels decided against publication because his previous writing speaks to the topic more specifically (Getzels 1978; Getzels and Csikszentmihalyi 1976).

This monograph's chief purpose is to report on issues and research in the field of gifted and talented education. The five chapters that follow are:

"The Teacher's Role in Identifying Intellectual Giftedness," by Maurice Freehill

"The Impact of Conceptions of Giftedness on Curricular Design," by Meredith Olson

"Math for Gifted Girls," by Nancy Cook

"Clinical Observations and Assertions about Guidance of Gifted Children," by Marshall Sanborn

"Goals, Programs, and Evaluation for Educating Gifted Children," by Robert A. Smith

Freehill, "The Teacher's Role in Identifying Intellectual Giftedness." Maurice Freehill has taught for many years at the Universities of Washington and Hawaii and Western Washington University on the education of the gifted. His experiences as an advisor, consultant, and professor, as well as director of several summer institutes in gifted education at the University of Washington has forced him to reconsider traditional practices in the identification of gifted students.

Freehill's main point is that the primary reliance on I.Q. tests and tests of cognitive ability belie the implicit understanding that some gifted students will not show up via this bias-laden methodology. Freehill advocates a more stringent case study approach to take into account the particular gifts

and talents that students have in the context of an open-ended gifted program. He admits, though, that even with the most sophisticated, multiphasic diagnotsic identification procedure, there will always be biases and gaps in the identification processes. He cautions educators to recognize these biases and gaps, to work to overcome the latent inequities inherent in any identification process, and to question continuously their own biases and approaches to identification.

Olson, "The Impact of Conceptions of Giftedness on Curricular Design." Meredith Olson has taught gifted children at Seattle Country Day School and is a doctoral candidate in science education at the University of Washington. She has been active with Lucille Beckman in conducting case study research on science education, science reasoning skills and identification procedures, and mathematics ability.

On the practical level, Olson encourages educators to recognize the inherently complex problem of matching an identification procedure with a curricular program, and the major problems of relying only on I.Q. tests and other verbally loaded identification processes. She recommends that educators look at a curriculum program and the learning style used in the activities before building an identification procedure.

Cook, "Math for Gifted Girls." Nancy Cook, a professor in curriculum and instruction at the University of Washington, primarily is interested in math education. Her research questioned the discrepancy between girls' and boys' scores on mathematics achievement tests beginning in the intermediate grades, because primary grade achievement scores showed no difference between sexes.

Cook reports on math avoidance among girls. She studied the curricular patterns of girls in Seattle high schools and found that many bright girls were not taking advanced mathematics, and in some cases they were counseled out of these courses. She found that peer pressure had instilled an impression that mathematics was for boys, not girls. Along with the Seattle Pacific Science Center, Cook initiated a short intensive math seminar for girls who had abilities in language arts, but who did not have correspondingly high scores in math achievement in grade eight. Cook describes the content, operation, and problems with the seminar and the surprisingly strong results that this short intervention had.

Cook's research demonstrates the need for educators to recognize sex bias in mathematics education and the need to eradicate typical stereotypes and infuse new role models. Cook advocates better counseling for girls in the intermediate grades to point out the many possible careers that require mathematics. The seminar is a useful model for cooperative ventures between colleges and public schools.

Sanborn, "Clinical Observations and Assertions About Guidance of Gifted Children." Marshall Sanborn reports on his extensive research at the University of Wisconsin's Guidance Laboratory for Superior Students, and lays out a well-documented set of assertions for programs of counseling the gifted.

Although the needs of gifted students are often similar to their peers, the gifted child's needs seem to be accentuated by peculiar abilities and insights. Sanborn details several case studies to illustrate the kinds of counseling needed and the insights that gifted children have about themselves.

Although Sanborn's assertions might appear simplistic, they should cause all educators to rethink their positions about gifted education. His final assertion on the need for excitedness and the development of giftedness may be

the most important statement in the chapter. The richness of Sanborn's case data speaks for itself, and the underlying interpretations for teacher educators are powerful if carried out.

Smith, "Goals, Programs, and Evaluation for Educating Gifted Children." Robert A. Smith, a professor of educational psychology at the University of Southern California, specializes in educational evaluation. For several years he has been a chief consultant to the Los Angeles school system's gifted program, and he has assisted in designing the statewide evaluation of gifted education in California.

Smith's premise is that representative subpublics should be considered in building an agenda for gifted programs on the basis of conscious goals. He names five subpublics in education--parents, students, teachers, school districts, and funding agencies--all of whom have different goals and perspectives that they bring to gifted programs. Any analysis of goals and evaluation of gifted programs should begin with an understanding of each group's perspective. The author builds an understanding of goals for gifted programs both out of the psychosocial needs and the cognitive abilities of the students. He stresses the role that responsible acceleration can play in gifted education along with meaningful enrichment and the "ability to suffer fools gladly." Smith concludes with an analysis of evaluation from the twin perspectives of subpublics and goal sets.

The implications of Smith's chapter are important in reconsidering the initiation, operation, and evaluation of gifted programs. The initiation of programs typically takes place because of the perception of a subpublic, to use Smith's term, for something to be done. Program operation is set up to satisfy the subpublic, such as a funding agency, teachers, or parents, and evaluation occurs through that limited focus. Smith describes all the subpublics that have a stake in a gifted program and makes the reader see that gifted programs have wide ownership with every group having important possible sets of goals.

Summary

In the fall of 1979, a group from the Washington Educational Research Association and the Northwest Gifted Child Association discussed a joint conference on the research and issues in gifted and talented education. They surveyed representatives from both organizations to set the agenda for the conference held last spring. This slim volume allows five of the invited speakers to submit their papers to a wider audience for critical evaluation. The monograph also discusses the implications for teacher education with respect to the where and how, the who, and the what of teacher preparation for working with gifted children. The interpretations and findings reported in this monograph can foster both better school practices and important research in the 1980s. As the adage goes, the beginning of all wisdom lies in knowing what one does not know.

REFERENCES

Bloom, Benjamin S., and Krathwohl, David R. Taxonomy of Educational Objectives: Handbook One: Cognitive Domain. New York: Longman, 1977.

Clausen, Robert. "University of Wisconsin Extension Television Series on the Gifted and Talented." Madison, Wisc.: University of Wisconsin, 1976.

Correll, Marsha M. Teaching the Gifted and Talented. Fastback 119. Bloomington, Ind.: Phi Delta Kappa, 1978. (ERIC Document Reproduction Service No. ED 166 887.)

Educational Programs That Work. Special Education. San Francisco: Far West Laboratory for Educational Research and Development, 1980. (ERIC Document Reproduction Service No. ED 185 745.)

Fisher, Mary Henri. "Competency-based Certification Requirements." Mimeographed. Raleigh, N.C.: North Carolina State Department of Education, Division of Gifted and Talented Education, 1974.

Gallagher, James J. Teaching the Gifted Child. 2nd ed. Boston: Allyn and Bacon, 1975.

Getzels, Jacob W. "Problem Finding and Research in Educational Administration." In Problem Finding in Educational Administration, edited by Glenn Immigart and William Boyd. Beverly Hills, Calif.: Sage, 1978.

_____, and Csikszentmihalyi, M. The Creative Vision: A Longitudinal Study of Problem Finding in Art. New York: John Wiley and Sons, 1976.

Maker, June C. Training Teachers for the Gifted and Talented: A Comparison of Models. Reston, Va.: Council for Exceptional Children, 1975. (ERIC Document Reproduction Service No. ED 119 453.)

National/State Leadership Training Institute on the Gifted and Talented. Ventura County Superintendent of Schools Office. 535 E. Main St., Ventura, CA 93009.

O'Connell, Carleen Matthews. IMPACTS on Gifted Education, A Guide for Talented and Gifted Educational Consultants. Portland, Ore.: Northwest Regional Educational Laboratory, 1980.

Priem, Thomas E. Star Power: Providing for the Gifted & Talented. Workshop Leader's Resource Guide for Star Power Module 1-10. Austin, Tex.: Educational Service Center Region 13, 1979. (ERIC Document Reproduction Service No. ED 176 499. For the modules, see Nos. ED 174 611 and ED 176 500 to 509.)

Vassar, William G., ed. Conn-Cept I: Practical Suggestions for Gifted and Talented Program Development for the Gifted and Talented. Hartford, Conn.: Connecticut State Department of Education, 1979. (ERIC Document Reproduction Service No. ED 179 042.)

Whitmore, Joanne Rand. Giftedness, Conflict, and Underachievement. Boston: Allyn and Bacon, 1980.

THE TEACHER'S ROLE IN IDENTIFYING INTELLECTUAL GIFTEDNESS

by Maurice Freehill

From both case accounts and research, evidence shows that no more than half of all intellectually gifted children are recognized as gifted while in school. A few, like Thomas Edison or Albert Einstein, manifest talents later in life, but legions of others remain permanently unknown. Some potentials are never developed, and others are squandered or perverted.

Teachers are sometimes impatient with the tasks of identifying intellectual giftedness; they would rather leave it to school psychologists, or say, "forget it and get on with teaching." Nevertheless, teacher involvement is essential, not only to bring a child into a testing program, but also to gain insight into child-specific differences. Identification serves not simply to categorize children or to sanction placement in a particular class; it also explicates individual attributes that should shape instruction. Instruction being the domain of the teacher, its modification is more probable when the teacher has had a role in diagnosis. That role should involve thinking through diagnostic questions, not just using a rating scale.

Common sense suggests that teachers and parents can judge who is gifted, but experience and research prove this is not true. More than 50 years ago, Terman asked teachers to nominate children who should be tested in the process to find gifted participants for the Stanford studies. Almost as an afterthought, he asked for the youngest child in each class. Without that group, he would have missed 19 percent of the final sample (Terman 1925).

As early as 1900, there was evidence that teachers who nominate gifted children for special programs miss significant numbers of these children, but include large numbers of children who are not gifted. Several later studies have confirmed that finding. Pegnato and Birch (1960) found in Pittsburgh junior high schools that teacher ratings were 45 percent effective. Of 91 children who qualified with Stanford Binet I.Q. scores of 136 or more, teachers nominated only 41 as gifted and missed 50. Beyond that, they nominated 113 non-qualifying children to earn an efficiency rating of only 27 percent of nominees validated. This study reviewed several other indicators and found, for example, that a mathematics achievement score was both more effective and more efficient than teacher nominations.

No more reassuring are subsequent studies with estimates of effectiveness ranging from 10 to 48 percent and efficiency slightly less (Gear 1976). These studies asked teachers to predict I.Q., which is closely related to academic competence, but less clearly correlated with school citizenship, orderliness, and other positive school attributes. I.Q. tests, particularly paper and pencil tests, call for rapid response to relatively common materials, and they naturally neglect much that is unique and gifted. These studies indicate that

teachers look at factors the tests overlook; they may consider the special conditions of life, the personal responses that correlate with imagination, the student's ability to generate new ideas or evaluative thinking. A teacher, more than a test, may perceive a constellation of factors. For example, scientists are found to differ from average on a large portion of all life experiences. Even young children may display a "science syndrome," a nonagressive asocial pattern associated often with lonely childhoods and intense relationships with mothers, as well as scientific interests and thinking skills. Discovery of a child scientist may depend on hearing a child's scientific vocabulary, being alerted by the child's scientific interest, or noting a special profile in the child's experience and behavior.

Ability measures, by test or by estimate, are based on current performance, and potential or innate capacity are only inferred. A test of intelligence, a test of aptitude, and a test of achievement may differ less on items included than on the purpose to be served or the inference to be drawn. To make these inferences, there must be an informed and organized understanding of relationships between performance and capacity.

Variability Among Gifted Students

Most important to identification is an understanding of the variability within a person or between persons who are gifted. Giftedness implies distinction, differentiation, and individuation. In an exact sense, there is no gifted type, but only instances. A group collected for intellectual superiority is not homogeneous; indeed, it is more divergent than a group collected for most other attributes. Evolution, both for the group and for the individual, is marked by increments of differentiation. The highest reaches of ability are characterized by the largest differentiations, the sharpest distinctions, and the most remarkable uniqueness.

Consider the cases of athletes or pianists who are products of limited ability, but ardent instruction and practice. They may be competent, but not truly distinctive. If they have had equal instruction and practice, one might expect performances to be alike or quite similar. However, athletes or pianists are referred to as talented only when they personalize or adapt a performance. With increments of artistry there are rising degrees of distinctiveness, and at superior levels it is not at all difficult to distinguish the performance of one from the other. Ordinary players may have accuracy and technical skill, but the talented ones add style, distinctive quality, and powerful imprints from personality.

The able person, given experience and opportunity, has extended options and a range of choices. On the other hand, a dull person has few options. Training increases the quality of directed performance, but not brilliance and variation. Deficits more than capacities are anchored to specifics. For example, mental illness is more defined and explicit than mental health. Errors can be more readily defined than excellence. For a deficit, we may know the etiology and be able to suggest remediation, but rarely would we either know the roots of high performance or be able to suggest a single program that will develop it.

Attention to the volatile and variable aspects of gifted behavior must lead to the view that no single behavioral profile can identify such divergent gifts. At a pragmatic level, almost all studies show a frequent occurrence of certain behaviors. Cluster analysis of mother's ratings of behavior indicate that intelligent children have behavior patterns more similar to one another

than to children with less intelligence (Duncan and Dreger 1978). Terman said that gifted children engage in activities such as those of normal but somewhat older children. Nevertheless, some clusters that characterize gifted appear rarely or not at all in agemates or even in older children: very early reading, philosophic orientation, and unique reorganizations of knowledge.

The pragmatic application of these generalizations must include some of the following:

Giftedness is multidimensional, therefore, one child enters a gifted group through a gate quite different from another. In order to surface many manifestations of ability in many settings, we should not require that each child pass the same gate. No one absolute criterion is appropriate.

It is expected that intelligence and achievement profiles for any gifted child may show very large deviations. No one can do more than he or she is able, but anyone may do less. A limited child cannot score greatly above an average individual performance. The gifted child may reach remarkable heights in some areas and mediocre or weak performance in others. It follows that the highest scoring categories achieved with awareness are the best predictors of potential. Scores below that may reflect lack of attention or lack of motivation, not lack of ability. Clearly, averaging high and low scores only confuses findings.

Behavioral indicators have differential values from one group to the next. Among well-nurtured mainstream children we find advanced verbal conceptualizing, the use of metaphor and analogy, symbol mindedness and excitement in ideas, words, and numbers. They are philosophic, they generalize, and many complex tasks seem to give them internal rewards. Culturally and ethnically different children demonstrate the same characteristics in different behaviors. They, too, generalize, respond to the complex, and seek to solve "why" questions.

Teachers naturally make judgments from schoolish tasks and not all are equally good indicators. Spelling is only loosely linked to higher mental processes. It is generally believed that arithmetic is a "hard" intellectual subject. That idea rises, in part, from the fact that we measure accomplishments in arithmetic more accurately than we measure social science, literary, or writing tasks. Nevertheless, arithmetic may be a poor indicator or a good one. It is sometimes offered as a set of memory or computational tasks making little call on intellect, but in other classes or different schools, arithmetic calls for invention and systematic thought in problem solving.

Primary teachers have frequently used reading as an indicator of ability. Reading competence is essential to school learning, and it comes near to thinking. It may also be more revealing of ability than other subjects because it is offered on a ragged or uneven front with each child at near ability level. A study in Iowa with children paired for equal mental age but unequal I.Q., showed the bright ones superior on every reading dimension but one (Bliesmer 1954). That was word meaning, which may reflect a shortage of experience in the brighter and therefore younger children.

Giftedness is characterized by extended style variations. High ability, used, gives positive feedback and a growing trust in one's own way of travel. With that there is often both strong and unique style. Best known are some effects of field dependence/independence. Independents have different experiences with parents, more autonomous experience and success in the natural sciences. Thorough identification should consider not one but many dimensions of style: impulsive/reflective, analytic/synthetic,

scanner/leveler, and others.

Abstract thinkers differ one from another. The mathematician is an abstractionist, and so is the poet, but both style and structure differ. Taxonomic systems such as Guilford's or Bloom's provide a system to classify thinking tasks into knowledge, analysis, synthesis, and others. Each calls for somewhat different elements. Tasks in the knowledge category call for identification, recalling, and defining, while synthesis may call for combining, modifying, or inferring. Individual differences in these attributes, whether genetic or acquired, are significant in a full definition of ability.

Motivation in Gifted Students

A second major consideration in identification is that giftedness is highly personalized and motivated. Creative work, in particular, is shaped by an author's personality, and in turn the work impinges on that personality. Emotionality does not bring superior work, but superior work calls for the engagement of emotion. The dancer, the philosopher, or the designer approaches artistry not in simple outpouring nor in restraint of feelings, but through incorporation of values and feelings into the product.

This involvement of self is natural for the person who can both understand and bring understanding to expression. It is an error to continue the myth that human brains are merely complex tools serving the same banal satisfactions found in lower animals. Even infants and toddlers have an appetite for knowing, and that grows into a passion when nurtured in able children. For them, knowledge is both drive and reinforcement. No wonder that researchers and parents have found these children "energetic," "volume producers," "broadly interested," and "ideationally fluent." They are endlessly aroused by the puzzle of knowledge as a young animal might be activated by running, climbing, or fighting.

Contemporary definitions of giftedness, more than early ones, include motivational attributes. In general, test items and observations function to uncover a deficit or failure when a subject fails to leap the barrier, answer the question, or reach the shelf. A screen or test that indicates ability differences usually functions to distinguish the limited from the average. It is an ability test because it distinguishes subjects as either able or unable to do the items at some standard of correctness. Superior performance is a different matter. To pass the screen above normal requires not just ability or competence, but also push or press. This performance has a much larger element of interest or intent, and failure is more often motivational failure.

The bright child has a natural reciprocity with knowing. The indicators of ability include: vigorous thinking; preference for wholeness more than piecemeal, excitement with complex tasks, rejection of memory and sequencing for parallel thinking, self-trust, assertiveness, sometimes stubbornness, intuition, and ability to generalize.

Identification in Special Groups

Much contemporary attention has been directed toward finding gifted children in cultural and ethnic populations that differ from the majority population. These efforts have included:

1. compensating test score supplements on the basis of comparing performances for dominant and minority populations;

2. constructing new tests by eliminating items on which the dominant group succeed or adding items that favor the minority (Bernal 1974);

3. developing special profile scoring on standardized tests (Bruch 1975);

4. discounting tests and depending on peer, parent, and teacher nomination (Torrance 1973).

These efforts have often been flawed because adjustments are based on differences between average, and not between gifted children. The content of testing and observation is more often average material than it is distinctively appropriate to bright children.

Charlotte Malone (1974) developed the Behavioral Identification of Giftedness Questionnaire (BIG), and using it later found that reasonably short subsets of behavioral items serve to describe gifted children in groups differentiated by social class, sex, and ethnic membership (Malone and Moonan 1975). Projecting from that research, it may be profitable to explore the use of subgroupings from behavioral items to find special groups of cognitively gifted children.

Teacher Rating Scales

Nomination lists and rating scales are widely used to supplement or to substitute for test data. However, there is little unison on definitions or the subcategories that should be rated. This ambiguity may be turned to advantage, because a closed and explicit definition necessarily excludes less clear and more divergent examples of giftedness and may too easily be employed in routine categorizing with little attention to individual differences. An open definition will increase the number and heterogeneity of nominees.

Such an open procedure appears less technical, but may demand more astute observation and more thoughtful interpretation of behaviors. For example, achievement data indicate school potential for most, but not all children. A threshold test score, however judiciously selected, will not predict potential achievements in art criticism or interpersonal fields.

Age of nominees also is important. The more precocious the child, the earlier and more valid are the manifestations of ability (Willerman and Fiedler 1977). Nevertheless, such signs may be overlooked because behavior is not yet consistent, or because there is little accumulated data. Selections at more advanced levels may focus on relatively specific abilities; so previous achievements become valid indicators. Grades, special vocabularies, and tested knowledge are all more specific than language complexity, early reading, and usage of information as predictors of primary school potential.

Rating scales have the usual limitations. Some teachers rate so that "superior" means average, while others rate universally low. The Hawthorne effect causes one positive or one negative observation to elevate or decline all elements of the rating. Teachers may give low ratings on traits possessed by the child but not elicited in the school, or on traits that are disguised and submerged in peer interaction. In some cases, an omitted check or rating has been counted as negative and averaged in the total rating.

Whatever the shortcomings, rating scales are firmly and widely established in practice. Scales should not be adopted from elsewhere, but should be studied and adapted for local use. Teachers will find guides such as Martinson's book on identification of considerable help in selecting and arranging useful scales (1974).

Arrangement of items into sections or umbrella groups will enhance the diagnostic value of ratings as the following sample illustrates:

1. Variable Performance
   a. Uses unique methods, is original
   b. Shows large subtest variances
   c. Has some remarkably elevated abilities

2. Abstract or Fluid Abilities
   a. Uses analytic reasoning
   b. Prefers advanced books
   c. Speaks in analogy and metaphor
   d. Asks unusual/insightful questions
   e. Devises systematic strategies

3. Conceptual Wholeness
   a. Retains target question through experiment
   b. Enjoys astronomy (or similar interest)
   c. Projects futures and anticipates consequences
   d. Persists in uncompleted tasks

4. Energetic
   a. Has long attention span
   b. Enjoys novelty
   c. Is curious, asks questions
   d. Has wide-ranging interests
   e. Chooses complex ideas and tasks
   f. Is self-confident

5. Accomplished
   a. Uses logical process such as scientific method
   b. Is consulted by other children
   c. Uses precise vocabulary
   d. Is highly competent in some academic areas
   e. Acquired conversation and reading skills early

6. Biographic Indications
   a. Enjoys older friends
   b. Leads in play activities
   c. Has collections or established hobbies
   d. Engages in discussions of political and social issues
   e. Is consulted by other children

7. Affective Involvement
   a. Has keen sense of humor
   b. Has social and moral concerns
   c. Has some intense commitments
   d. Is sensitive to poetic or historic material

Summary

Optimum cognitive development is an educational goal for every child, but to achieve that, it is necessary to provide a case specific set of learning opportunities. Therefore, it is essential to define and understand individual attributes. As the person responsible for instruction, the teacher has a major role in identifying gifted students and interpreting their individual attributes. Teachers are cautioned not to rely exclusively on their observations, on pencil and paper test scores, or on rating scales. A combination of these and other factors, including age, motivation, and personality, should be used to identify gifted children.

REFERENCES

Bernal, E.M. "Gifted Mexican American Children: An Ethno-scientific Perspective." California Journal of Educational Research 25, 5 (November 1974):261-73.

Bliesmer, E.P. "Reading Abilities of Bright and Dull Children of Comparable Mental Age." Journal of Educational Psychology 34, 6 (October 1954):321-31.

Bruch, C.B. "Assessment of Creativity in Culturally Different Children." Gifted Child Quarterly 19, 2 (Summer 1975):164-74.

Duncan, J.A., and Dreger, R.M. "Behavioral Analysis and Identification of Gifted Children." Journal of Genetic Psychology 133 (1978):43-57.

Gear, G.H. "Accuracy of Teacher Judgment in Identifying Intellectually Gifted Children: A Review of the Literature." Gifted Child Quarterly 20, 4 (Winter 1976):478-89.

Malone, C.E., and Moonan, W.J. "Behavioral Identification of Gifted Children." Gifted Child Quarterly 19, 4 (Winter 1975):301-06, 271.

Martinson, R.A. The Identification of the Gifted and Talented. Ventura, Calif.: National/State Leadership Training Institute on the Gifted and Talented, 1974.

Pegnato, C.W., and Birch, J.W. "Locating Gifted Children in Junior High Schools: A Comparison of Methods." Exceptional Children 26, 5 (January 1960):227-31.

Terman, L.M. Mental and Physical Traits of a Thousand Gifted Children. Genetic Studies of Genius, vol. III. Stanford, Calif.: Stanford University Press 1925.

Torrance, E.P. "Non-test Indicators of Creative Talent Among Disadvantaged Children." Gifted Child Quarterly 17, 1 (Spring 1973):3-9.

Willerman, L., and Fiedler, M.F. "Intellectually Precocious Preschool Children: Early Development and Later Intellectual Accomplishments." Journal of Genetic Psychology 131 (1977):13-20.

THE IMPACT OF CONCEPTIONS OF GIFTEDNESS ON CURRICULAR DESIGN

by Meredith Olson

Many programs for gifted high academic achievers rely heavily on verbal intelligence tests, such as Stanford-Binet, for entrance into curricular programs for gifted children. The educational literature continues to espouse the idea that such tests are valid means for assessing general intelligence (Clark 1979). The Weschler Intelligence Scales for Children (WISC), too, is seen perhaps as being valuable in making curricular decisions, but differential usage of the subscores has not received recognition as useful in identifying discrete attributes of giftedness. Clark stated, "Research on score patterns has yielded little to confirm and much to challenge such definitive usage" (p. 412). WISC has high reliability coefficients for the verbal and performance scales (.86 to .96 and .96 to .90, respectively), but according to Clark, the test failed to discriminate the extreme ages of 5 to 6 years old and 14 to 15 years old. Thus, she believes that its sensitivity in testing gifted children is limited.

Although some score analysis has been largely glossed over in placing students in high academic programs, there is a substantial body of research suggesting the importance of subscore analysis. Work by Sandor (1932), Scheerer, Rothmann, and Goldstein (1945), Anastasi and Levee (1959), and Rimland (1964) all point to the existence of great genius amidst general average aptitude. The United States Employment Service, using Ghiselli and Brown's (1951) and Dvroak's (1947) subscore factors, developed the Civil Service tests are widely used to predict success in specific occupational areas. The armed services have also shown dramatic success in the use of subscore factors for the classification and selection of Air Force personnel.

Our research at Seattle Country Day School and the University of Washington suggests that several subscores of the Naval Research Test Battery and the Block Design subscore of the WISC may hold clues to differential behaviors among gifted children in science and theoretical mathematics. Specifically, our work suggests that spatial, transformational, and syllogistic reasoning tests (in which one is forced to disregard verbal labels) may be more important discriminators of intellectual potential than verbal recognition abilities.

In addition, we have found in ex post facto research that when children's preferences for verbalization are established early in life, those preferences may interfere with the development of nonverbal reasoning. For example, many gifted physics students were observed to possess the ability to respond to situations via nonverbal logical analysis and intuition. Verbal ability is undoubtedly necessary for students to communicate nonverbal logic, but only

after intuitive understanding is achieved can conclusions be verbalized.

More than two decades of teaching and observing science classes made us aware that many of our gifted students were uninspired by the traditional verbal, didactic approach to science lessons. When only books were available, science was treated as a reading lesson to be memorized, regurgitated, and forgotten, not as a new territory to be explored. However, some of our gifted students demonstrated an intuitive, playful grasp of difficult concepts and insisted on finding relations in their own, seemingly more chaotic, ways. We noticed when in the laboratory that students divided themselves into two groups--those who wanted books for guidance, and those who wanted the books removed so they could proceed with their work.

The same cognitive preferences were noted in mathematics. Although most students in gifted programs completed mathematics assignments satisfactorily and on time, certain differences were observable in their behavior. One group appeared to enjoy book work, particularly when lessons were graded. They worked diligently for 'A' grades, and often completed extra credit sections when it was to be appended to their grades. Another group, while cooperatively completing most assignment problems, appeared to be fascinated by inquiry problems from the mathematics column in Scientific American magazine. When the teacher posed such problems, they would become so involved in the mathematical investigation, that food, sleep, and other homework suffered neglect. Our studies were in agreement with published studies, such as that by Peterson, Guilford, Hoepfner, and Merrifield (1963), in suggesting that mastery of mathematical problems was not a good predictor of careers in science or engineering. Our work increasingly suggests that a type of spatial-transformational thought which uses logical processes not constrained by verbal definition underlies this creative mathematical behavior.

Our research curriculum investigation suggests that highly significant information may be derived from looking at subscore differentiation within the profile of a single child, rather than referring attained scores to norm-referenced tables. This finding is in agreement with recent trends in single-subject research reported in psychological literature (Kaufman 1979, p. 203). Kaufman (p. 54) found statistical significance in a three-point difference between a single scaled score on the WISC, and the average of the verbal- or performance-scaled score. Our curriculum design project has found similar significance within thirty factor-analyzed figural subtests. Students whose individual profiles show relatively high ability in selecting known figures from an array of figures, relatively low ability in mentally folding and dissecting shapes, and relatively low ability in syllogistic reasoning in which silly word usage confuses standard meaning are those rapid information processors who like to get straight 'A' grades, but who rarely become excited by the subject matter. The reverse profile is uniformly exhibited by students who work late into the night on science and mathematics to the detriment of other scheduled tasks.

The curricular analysis currently in progress has a particular urgency in view of the sudden awareness nationally of the political and economic consequences of technological stagnation. Concern is currently being widely expressed in publications such as Mechanical Engineering, (Marlowe 1980), Science (Abelson 1981), and U.S. News and World Report (Torrence 1980), that our country is running on past creativity. "'Who is to innovate?' is the urgent question. Nearly every science and mathematics convention in the past year has included questions concerning how we can redevelop technological creativity. Our investigation of the relationship between verbal achievement and factors underlying nonverbal concept construction appear to begin to

address the national educational dilemma" (Abelson 1981, p. 123).

Because of the number of "severely" gifted students available to us in our research is limited (we have 62 in the current project), it seems appropriate to compare our recent findings with the large body of literature characterizing thought processes of previously identified creative geniuses.

Peculiar Habits of Gifted People

Of the people who create and the people who study them, most agree that the act of creation passes through a sequence of stages (Gallagher 1975). Wallas (1926) proposed the four well-known stages: preparation, or investigation from all sides; incubation, or a period of subconscious thought; illumination, or the moment when the idea presents itself; and verification, or the test for validity. In an extensive study of creative mathematicians, Jacques Hadamard (1945) found that almost all claimed to use vague images, which most frequently were visual (McKim 1972). Getzels summarized the preverbal mental processes as follows:

> In the arena of problem solving and thinking...several relevant points can be outlined in simplified fashion: (a) the basic cleavage in thought is that between two processes, an unconscious, arational PRIMARY process and an ego-controlled rational SECONDARY process, (b) the interaction between the two processes is conflictual, involving repression and defense, (c) creative thought derives from an elaboration of the "freely rising" primary fantasies, (d) it is when these unconscious forces become ego-syntonic that the occasion exists, in Freud's words, for "achievements of special perfection," i.e., creativity.... (1964, p. 240-67)

Maslow and Neisser both disagree with Freud in that the primary and secondary processes are antagonistic (McKim 1972). Maslow discussed the ability to use fantasy, to "let loose, to be crazy privately," but he believed that most people lose their primary creativeness as they grow up. Neisser suggested that primary processes crudely define all ideas before secondary processes transform the ideas into rational verbalizations.

Sentences and mathematical statements are both formed in linear patterns, and the mental operation of composing such statements automatically imposes a direction toward a particular end. Conversely, gestalt ideation and visual imagery encompass holistic perspectives that allow all sorts of unconventional comparisons of ideas. The following citation illustrates two brilliant scientists' processes of ideation:

> Although labels lead us to think of the various sensory modes of imagination as though they occur separately, in actuality imagination is polysensory. Albert Einstein in a famous letter to Jacques Hadamard described the important role of polysensory imagination in his own extremely abstract thinking:
>
> > The words of language as they are written and spoken, do not seem to play any role in my mechanism of thought. The psychical entities which seem to serve as elements in thought are certain signs and more or less clear images which can be voluntarily reproduced and combined...

> conventional words or other signs have to be sought for laboriously in a secondary stage, when the above mentioned associative play is sufficiently established and can be reproduced at will. (Hadamard 1945, p. 142)

The chemist Kekule came upon one of the most important discoveries of organic chemistry, the structure of the benzene ring, in a dream. Having pondered the problem for some time, he turned his chair to the fire and fell asleep:

> again the atoms were gamboling before my eyes.... My mental eye...could now distinguish larger structures...all twining and twisting in snakelike motion. But look! What was that? One of the snakes had seized hold of its own tail, and the form whirled mockingly before my eyes. As if by a flash of lightning I awoke. (Koestler 1964, p. 212)

The spontaneous inner image of the snake biting its own tail suggested to Kekule that organic compounds, such as benzene, are not open structures but closed rings. (McKim 1972, p. 9)

In 1890 in a widely published paper, "The Method of Multiple Working Hypotheses," the famous astronomer Chamberlin discussed a peculiar habit of mind that was understood by those who used it, but not by most other people. His description of "a habit of complex or parallel thought" follows:

> Instead of a simple succession of thoughts in linear order, the procedure is complex, and the mind appears to become possessed of the power of simultaneous vision from different standpoints. Phenomena appear to become capable of being viewed analytically and synthetically at once. It is not altogether unlike the study of landscape from which there comes into the mind myriads of lines of intelligence, which are received and co-ordinated simultaneously, producing a complex impression which is recorded and studied directly in its complexity. My description of this process is confessedly inadequate, and the affirmation of it as a fact would doubtless challenge dispute at the hands of psychologists of the old school, but I address myself to naturalists who I think can respond to its verity from their own experience.
>
> The method has, however, its disadvantages. No good thing is without its drawbacks; and this very habit of mind, while an invaluable acquisition for purposes of investigation, introduces difficulties in expression. It is obvious, upon consideration, that this method of thought is impossible of verbal expression. We cannot put into words more than a single line of thought at a time; and even in that the order of expression must be conformed to the idiosyncrasies of the language, and the rate must be relatively slow. When the habit of complex thought is not highly developed, there is usually a leading line to which others are subordinate, and the difficulty of expression does not rise to serious proportions; but when the method of simultaneous vision along different lines is developed so that the thoughts running in different channels are nearly equivalent, there is an obvious embarrassment in selection and a disinclination to make the attempt. Furthermore, the impossibility of expressing the mental operation in words leads to their disuse in the silent process of thought, and hence words and

> thoughts lose that close association which they are accustomed to maintain with those whose silent as well as spoken thoughts run in linear verbal courses. There is therefore a certain predisposition on the part of the practitioner of this method to taciturnity. (1890)

McKim (1972) believed that thinkers who cannot escape the structure of language and who are unaware that thinking can occur in ways having little to do with language are often using only a small part of their brains. In The Act of Creation, Koestler wrote, "Language can become a screen which stands between the thinker and reality. This is the reason that true creativity often starts where language ends" (1964).

In a paper titled "Emotional Blocks to Creativity" (1962), Maslow described two kinds of creative people. He considered many good scientists to be "rigid" in the sense of being afraid of their unconscious thoughts. Effective scientists who make their contributions by working along with a lot of other people are primarily capable only of what Maslow called "secondary creativeness." These people cope with the world logically, objectively, and methodically, but they have lost intimate contact with the nonverbal, insightful characteristics of creative discovery.

Getzels (1964) pointed out the paradox, which is especially difficult for the teacher, that despite the need for rationality in problem solving and logic, and despite the required training in reflective forms of reasoning in school, mature creative thinking and insight entail a regression to playfulness, fantasy, and irrationality of the primary thought process. Teachers frequently ask for verbal explanations of what students are thinking, but premature expression of an idea may inhibit or censor creative thoughts. Teachers should be aware that the act of ordering thoughts for rational verbalization may itself change the ideas contained in those multiple thoughts. In addition, when an idea is stated verbally, the label attached to it brings emotional baggage that may not be appropriate to the existing setting. Verbalization damages the process of multiple thought in two other ways: It requires that one aspect of a matrix be examined at a time, which slows the process of thought and changes the relative developmental emphasis.

The concept of multiple thought processes stands in contrast to a current trend in gifted education to teach classes in creativity. As Kubie wrote in Neurotic Distortion of the Creative Process:

> We do not need to be taught to think: indeed...this is something that cannot be taught. Thinking processes actually are automatic, swift, and spontaneous when allowed to proceed undisturbed by other influence. Therefore, what we need is to be educated in how not to interfere with the inherent capacity of the human mind to think. (1958)

Pedagogical Implications of Multiple Nonverbal Ideation

As Einstein noted, following the surge of multiple nonverbal ideation is a time of reflection on each attribute of the system of relationships. When the ideas are firm and reproducible, verbalization is both helpful and necessary. Pedagogically, teachers should exhibit a profound respect for unique, specific cognitive processes as these are experienced by different students. The sudden flow of an idea matrix is spontaneous and unpredictable,

and it argues against brainstorming sessions that produce verbal lists, as well as against the common teaching strategy of calling on students to speak in class. The psychological environment that is important to the creative process is an expressed and implied absolute respect for the integrity and individuality of every child's mind. Creativity is enhanced within this secure, supportive atmosphere where students are allowed to volunteer their ideas verbally when ready.

The science education community has long supported the motto, "ideas first, words later." For example, Fuller, Karplus, and Lawson (1977) claim that the life of every physicist is punctuated by events that lead to the discovery that the way physicists see natural phenomena is different from the way nonphysicists see them. The physics community also suggests that secondary and elementary teachers do not take advantage of inquiry-oriented techniques, which appear to be so necessary to the development of logical thought (McKinnon and Renner 1971). McKinnon experimented with the development of an inquiry-oriented science course based on Piaget's theory of cognitive development and found highly significant differences between those students who took the experimental course and those who took a regular course.

Case study research by Olson (1980) suggested that Piagetian tasks require a nonverbal analysis of problems followed by verbal explanation of the solution. The research indicated some primary process of nonverbal analysis that was being elicited in the Piagetian setting. It is questionable whether children below the ages of 10 or 11 can produce what Piaget considered a formal structure of thought. Also, what this structure has to do with the primary thought process needs more definition, but possibly different kinds of instruction affect the preferential thinking styles that children develop.

Research With the WISC Block Design

Through a small grant program of the Northwest Area Foundation, we are gathering extensive longitudinal data on the behaviors of 9-, 10-, 11-, 12-, and 13-year-old students in relation to changes in cognitive processes. Patterns of reading preference are being related to Piagetian stages of cognitive development, as are studies of what students touch, look at, and listen to, and the comments they make at various ages. More than 200 science classes have been audiotaped and the transcripts are undergoing analysis. Volunteered comments are being analyzed in a Piagetian manner for self-confidence in conjecture, causal claims (anthropomorphic vs. physical cause), multiple hypothesis vs. linear "right answer" orientation, Piagetian conservation levels, and preferential attention focus (physical objects vs. interpersonal). Our goal is to prepare a research-based curricular project that demonstrates the type of student most likely to respond to particular lesson formats. Our conjecture is that if science course format can more nearly match student cognitive ability--with the intent of slowly moving students to more logical action if possible--achievement and interest in science will be enhanced.

In a preliminary overview of the data, specific trends in student behavior are discernible. For example, no 9-, 10-, or 11-year-old student with a WISC Block Design score below 14 has been observed to entertain parallel ideation. Audiotapes and observer checklists both indicate that students with scores ranging from 14 to 15 have the highest frequency of volunteered comments during class discussions, and that students with scores ranging from 18 to 19 have the lowest frequency of volunteered comments.

Three of the latter have on every occasion offered support for hypothesis development, and the fourth has consistently stated objective data without overt indication of hypothesis generation. Although the ages of the students may have some bearing on their styles of comment, the parsimony of volunteered comment in those students who are developing multiple or parallel ideation is evident at these early ages.

Several generalizations appear to fit the second most quiet group whose scores fell below 14. They rarely have data to share about the experimental topic; they spend larger portions of their laboratory time in social interaction (asking advice, checking accuracy of set-up, and talking about nonscience topics); they share data during class discussions as if quoting it from books or seeking authority via teacher approval. Strong confidence in their assertions is not evident, and the likelihood of holding tentative hypotheses that may be wrong appears to be low among these students. They seem to value "right" answers.

A preliminary analysis of causal statements made by children over the age of 8 suggests that those less able to pose hypotheses seek causes in simple motivation, and it indicates that they are not satisfied with mechanical causation. They look for some internal force residing in an object and express it often in anthropomorphic terms, such as "water needs to rise in plants" or "plants seek sunlight." This kind of child seeks prompt psychological closure and asks questions as if answers were always possible. They exhibit an authoritarian conception of knowledge in which distinct truths and falsehoods exist. They want "right" answers and expect practice exercises to reappear on quizzes with no significant changes. They memorize rapidly and expect to regurgitate on tests. They have great difficulty grasping the idea of a "given." We suspect that those students who are free of this limited view of learning have enhanced their abilities to consider hypothetical "ifs" through their well-defined preferences for reading science fiction.

Under the age of 8, children in our study appear to be unable to perceive another person's mind set and understand when they are communicating. They expect their words to be understood and never question their abilities to explain. Although some students with high Block Design scores have been able to detect the inner structure of block patterns and number arrays, most young students are not able to evaluate their reasoning verbally. They simply know that "they know," and they demonstrate their understanding by accurately predicting the next member. Preverbal logical ability in this age group needs more careful examination.

Cronbach (1967) suggested that aptitude information is of value, when it ue,an be demonstrated that it interacts with treatment conditions. Bract and Glass (1968) advocated the use of factorially simple measures in evaluating the cognitive profile of students. The WISC Block Design, while apparently the best available screening tool for student identification, appears to require both spatial and logical skills for its solution (Kaufman 1979, p. 158). The more simple factors used in the military testing procedure are illuminating attribute-treatment-interaction in curriculum design. Our observations have convinced us that the way students pay attention to items in their environment is reflected in their profile of factorially simple subscores. Multiple ideation and withheld verbalization personality styles correlate well with a personal score profile in which verbal-confounded syllogistic logic and three-dimensional spatial transformation are not at the bottom of the profile and in which matching recognized figures is not the strongest skill. Rapid information processors who value a correct answer more than an intelligent answer show the reverse individual profile. This new

precision and attribute profile characterization allows the design of treatment conditions that will more precisely evaluate curricular design. It is now possible to ask what types of interactions occur between student attributes and lessons using science books as opposed to lessons posing science problems with minimal verbiage. Treatment conditions that vary the degree of selectivity of events all the way from the great matrix of the natural world to the programming of cookbook steps can be evaluated by their interaction with cognitive attribute profiles. The type of inquiry science developed in the '60s and '70s is not appropriate for everyone. The type of science presented in elementary school (show and tell textbooks) is not appropriate for everyone. Both teachers and students have cognitive styles. The way they habitually focus their attention on social interaction or on physical events appears to strongly correlate with factored subscore strength within their individual profile.

Attribute treatment interaction analysis shows great promise of shedding new light on why teachers teach they way they do, and on why students respond to lesson formats the way they do. Traditional views of creativity that entail divergent production and verbal imagery may be useful, but also such attempts may make unwarranted assumptions about the nature of the development of creative behavior in science and mathematics.

Summary

Although the mass of our theoretical perspectives and data collections may appear chaotic, the arguments begin to fuse into a coherent conception of the nature of scientific genius. Nonverbal and preverbal logical abilities demonstrate a classical interaction with science and mathematical creativity. The conceptualization of scientific genius which focuses on preverbal logical ability demands revision of science curricula. The Sputnik era of the late 1950s and '60s brought empiricism, which fits the traditional Western model of education and research, but it also brought an overwhelming verbiage and adult style to elementary and secondary science texts. Verbal and spatial skills have been treated as one and the same, but, as our research shows, verbal skills are not the best predictors of science or mathematics creativity. In addition, education's emphasis on verbal skills may be to the detriment of children's developing thought processes. Educators must make a better match between preferential attention patterns and curricular styles, in order to address the issues associated with the development of scientific creativity.

REFERENCES

Abelson, P.H. "Shortages of Scientists and Engineers." Science 211 (1981):123.

Anastasi, A., and Levee, R.F. "Intellectual Defect and Musical Talent: A Case Report." American Journal of Mental Deficiency (1959-60):659-703.

Bract, G.H., and Glass, G.V. "The External Validity of Experiments." American Educational Research Journal 5 (1968):437.

Cronbach, L.J. "Instructional Differences and Individual Differences." In Learning and Individual Differences, edited by R. Gagne. Columbus, Ohio: Charles E. Merrill, 1967.

Chamberlin, J.C. "The Method of Multiple Working Hypotheses." Science 148 (1890):745-59.

Clark, Barbara. Growing Up Gifted. Columbus, Ohio: Charles E. Merrill, 1979.

Dvroak, B.J. "The New USES General Aptitude Test Battery." Journal of Applied Psychology 31 (1947):372-76.

Fuller, Robert; Karplus, Robert; and Lawson, Anton. "Can Physics Develop Reasoning?" Physics Today (February 1977):23-8.

Gallagher, James J. Teaching the Gifted Child. Boston: Allyn and Bacon, 1975.

_____. "Issues in Education for the Gifted." In The Gifted and Talented: Their Education and Development, NSSE Yearbook 1978, pp. 28-44. Chicago: National Society for the Study of Education, 1979.

Getzels, Jacob. "Creative Thinking, Problem Solving, and Instruction." In The Theories of Learning and Instruction, NSSE Yearbook 1963, pp. 240-67. Chicago: National Society for the Study of Education, 1964.

Ghiselli, E.E., and Brown, C.W. "Validity of Aptitude Tests for Predicting Trainability of Workers." Personnel Psychology 4 (1951):243-60.

Guilford, J.P. The Nature of Human Intelligence. New York: McGraw-Hill, 1967.

Hadamard, Jacques. The Psychology of Invention in the Mathematical Field. New York: Dover, 1945.

Kaufman, A.S. Intelligent Testing with the WISC-R. New York: John Wiley, 1979.

Koestler, A. The Act of Creation. New York: Dell, 1964

Kubie, L. Neurotic Distortion of the Creative Process. Lawrence, Kan.: University of Kansas Press, 1964.

Marlowe, D.E. "Engineering Education: Issues and Answers." Mechanical Engineering December 1980, p. 24.

Maslow, A. "Emotional Blocks to Creativity." In A Sourcebook for Creative Thinking, edited by S. Parnes and H. Harding, New York: Charles Scribner's Sons, 1962.

McKim, R. Experiences in Visual Thinking. Belmont, Calif.: Wadsworth, 1972.

McKinnon, J., and Renner, J. "Are Colleges Concerned with Intellectual Development?" American Journal of Physics 39, 9 (September 1971):1047-52.

Peterson, H.; Guilford, J.P.; Hoepfner, R.; and Merrifield, P.R. Determination of 'Structure-of-Intellect' Abilities Involved in Ninth-Grade Algebra and General Mathematics. Cooperative Research Project No. 1342. Los Angeles: University of Southern California, Psychological Laboratory, October 1963.

Remlin, B. Infantile Autism. New York: Appleton, Century, Croft, 1964.
Sandor, B. "The Functioning of Memory and the Methods of Mathematical Prodigies." Character and Personality 1 (1932):70-4.
Scheerer, M.; Rothman, E.; and Goldstein, K. "The Case of the Idiot Idiot Savant. An Experimental Study of Personality Organization." Psychological Monographs (Hold No. 269) 58, 4 (1945).
Torrance, E.P. "For Many, Being Gifted Brings Lifelong Struggle. U.S. News and World Report, 15 December 1980.

MATH FOR GIFTED GIRLS

by Nancy Cook

Intellectually capable females continue to avoid mathematics in high school, and upon entering a university, these young women find that their lack of mathematics training drastically reduces their career options.

Four years of high school mathematics are required for admission to 15 of 20 fields of undergraduate study at the University of California at Berkeley. In 1972, 8 percent of the first-year females, compared to 58 percent of the first-year males, had taken four years of high school mathematics. That is, 92 percent of the entering females did not qualify for admission to 75 percent of the undergraduate fields of study due to a lack of mathematical training (Sells 1973). Remick and Miller (1978) reported similar findings. Four years of high school mathematics are required for 11 of the 16 fields of undergraduate study at the University of Washington. In 1976, 22 percent of the entering females, compared to 44 percent of the entering males, had taken four years of high school mathematics.

The problem continues to persist. The recent National Assessment of Educational Progress (NAEP) included data on mathematics participation by sex. Although there were no sex differences in participation in algebra I and geometry, significantly more males than females participated in trigonometry and calculus (NAEP 1979). Similar data are reported in both the Women in Mathematics study (Armstrong 1980) and the Equals Bay Area mathematics participation data (Kreinberg 1980).

Mathematics avoidance cuts across all ethnic boundaries; females, regardless of ethnic origin, lack the mathematical background that permits freedom in choice of career. Remick and Miller found that 31 percent of Caucasian and Asian females entered the University of Washington with four years of high school mathematics, but only 13 percent of black and Hispanic females entered with such training (1978). Sells' (1980) unpublished data show similar findings.

Intellectually capable girls--gifted girls--avoid mathematics. Bright girls tend to exclude themselves from high school mathematics courses (Haven 1972). Because of this avoidance, the magnitude of sex differences in mathematics achievement increases, rather than decreases, with giftedness (Fox 1976). For the study of Mathematically Precocious Youth, an annual talent search is conducted, the results of which consistently show increasing sex differences in mathematics achievement as a function of mathematics scores. That is, as the score increases, the proportion of girls decreases (Keating 1976). "Gifted boys outperform gifted girls on precollege level tests of mathematical ability, and the differences in performance are particularly striking at the upper ends of the distributions" (Fox 1976, p. 184).

What factors are associated with mathematics avoidance? Until the pioneering work of Fennema and Sherman (1977), it had been assumed that females were less capable of learning mathematics. However, Fennema and Sherman (1977; 1978) documented that females who choose to study mathematics do as well as males. The problem is that more capable females than capable males choose not to study mathematics. Similar results are reported by De Wolf (1978), who reported no differences on the basis of sex in mathematics achievement, if the amount of mathematics studied is controlled.

Although both Fennema and Sherman as well as De Wolf found no sex differences in problem solving when amount of mathematics studied is controlled, recent data show otherwise. Both the 1979 NAEP results and the Women in Mathematics study (Armstrong 1980) reveal no sex differences in mathematics achievement on all areas except problem solving. Both sets of data show males to be better problem solvers than females, regardless of the amount of mathematics studied.

The effect of problem-solving ability on mathematics avoidance is not well-known, but some data suggest at least an indirect relation. Problem-solving skills and attitudes toward mathematics are significantly correlated (Fennema and Sherman 1977; 1978), as are mathematics participation and avoidance, and attitudes toward mathematics (Armstrong 1980; Lantz 1980). Therefore, it would not be surprising to find problem-solving skills and mathematics avoidance correlated.

Two additional factors consistently reported to be correlated with mathematics avoidance are usefulness and confidence (Fennema, Reyes, Perl, and Konsin 1980; Lantz 1980; Armstrong 1980). Males are more aware than females of the role mathematics will play in their future career choices. In part because of this lack of awareness of the usefulness of mathematics, females tend not to study mathematics. In addition, males appear to have more confidence in their mathematical ability, and this lack of confidence on the part of females also contributes to their mathematics avoidance.

The perception of the usefulness of mathematics appears to be the affective factor most associated with the continued study of mathematics in gifted girls. The best predictor of gifted high school females' participation in mathematics courses is their perception of how useful mathematics will be to their future career choice (Haven 1971). In addition, Fox (1976) found that failure to attend to the social interests of girls could lead to increasing mathematics achievement differences of gifted students according to sex.

Males and females do not attribute success to the same factors. Males tend to attribute success in general to internal, stable causes such as ability, while females tend to attribute success to external, unstable factors such as luck. Attribution of failure is reversed; males tend to attribute failure to luck, and females tend to attribute failure to ability (Deaux 1976; Bar-Tal and Frieze 1977). Although males and females attribute both success and failure in mathematics to internal causes, males attribute success to internal factors significantly more than do females (Fennema et al. 1980).

In summary, females, including gifted females, avoid mathematics, but the continued study of mathematics is necessary to assure full choice of career options. Data suggest that when females are aware of the usefulness of mathematics in relation to career choice, they are more apt to continue to study mathematics.

Math for Gifted Girls Program

The Pacific Science Center received funding from the Northwest Area Foundation to develop a program in Seattle, Washington, that had as its goal the prevention of mathematics avoidance in gifted females. Because research has shown that awareness of the usefulness of mathematics is the foremost factor associated with avoidance, the primary goal of the program was to increase gifted girls' awareness of usefulness in relation to career choice. The program also had two other goals: increase gifted girls' confidence in their abilities to do mathematics, and to increase their mathematics abilities.

First, to insure a multiethnic participant population, Seattle, rather than surrounding suburban areas, was selected as the target population. Because mathematics avoidance begins to surface in the early adolescent, participants were selected from Seattle middle schools. The target population within these grades were those girls who scored at the 85th percentile or above in language arts and at the 55th percentile or below in mathematics on the last citywide standardized test.

Second, to insure individualized instruction, the number of participants was limited to 20. To maximize the potential for social interaction among the participants both during the program and when the girls returned to their respective schools, the number of participating schools was limited to three, and at least five girls came from each school. Because all schools had large numbers of Caucasian girls who met the criteria, only the three schools that had the largest number of ethnic minority students meeting the criteria were identified as the target schools. Letters inviting participation in the program were sent to all the girls who met the criteria in these three schools. Participants were chosen on a first-come basis within the restrictions that there be at least five girls from each school and at least five ethnic-minority girls.

Active recruitment of teachers was unnecessary. As word of the project spread, interested teachers volunteered, resulting in an exceptionally qualified and dedicated staff who, as a team, brought together expertise on mathematics from a variety of disciplines. The teaching team included a University of Washington mathematics educator, the head of a private high school's mathematics department, a biologist who is also a professional musician, and a practicing school psychologist who is a former mathematics teacher. In addition to the teaching staff, the director of gifted education programs at the Pacific Science Center and a practicing school psychologist participated in conducting two meetings for parents.

The Math for Gifted Girls curriculum included four general themes: (a) innovative review of those topics in mathematics known to present difficulties to early adolescents, such as fractions and percents; (b) inclusion of topics not in the regular mathematics curriculum, such as computer programming; (c) a focus on spatial activities, such as improving the ability to visualize three-dimensional objects; and (d) a focus on career awareness through the use of role models as well as discussion of the relation of mathematics to a variety of careers. These four themes were integrated and sequenced into a total curriculum that was taught in six full days over the course of three weeks (see Table 1). Although many of the activities are self-explanatory, the rationale behind some must be detailed.

Three topics known to present difficulties for adolescents are fractions, percents, and graphing. Two of these topics, fractions and graphing, include a spatial component and can be integrated into the focus on improving spatial

TABLE 1

MATH FOR GIFTED GIRLS CURRICULUM

DAY ONE: (1st week)	Instant Investigations Computers: Logic Games Spring Balances: Introduction Lunch: Tour Science Center Logic Games: Strategies Spring Balances: Construction Discussion
DAY TWO: (1st week)	Instant Investigations: Graphing Computers: Simulation Logic Games: Practice Lunch Spring Balances: Graphing Visualizing Fractions: Addition and Subtraction Discussion
DAY THREE: (2nd week)	Instant Investigations: Logic Puzzles Computers: Programming Calculators: Operations Review Lunch Physical Fitness: Body Fat Density: Small Objects Discussion
DAY FOUR: (2nd week)	Instant Investigations: Logic Puzzles Body Density: Percentage of Body Fat Calculators: Percents Lunch Visit to Physical Fitness Laboratory Discussion
DAY FIVE: (3rd week)	Density: Relating Concrete to Symbolic Visualizing Fractions: Multiplication Spatial Tasks: 2-D Rotations Lunch Calculators: Percents and Rates Spatial Tasks: 3-D Imagery Discussion
DAY SIX: (3rd week)	Instant Investigations: 3-D Constructions Age Dating Material Through Pollen Counts (field trip conducted by Dr. Estella Leopold, director Quanternary Research Center, University of Washington) Cake Problem (with lunch) Program Evaluation and Discussion

Note: For most sessions, the girls were divided into two groups, but they had free choice to go into either group at any time throughout the program.

skills. Note that an entire sequence on spring balances leads to a final component on graphing. The third topic, percents, can be approached through activities focused on physical fitness, a topic of vital interest to the adolescent female.

Adolescent females are most concerned about their bodies, especially body fat. This interest was used to introduce body density, which was related to density in general. The calculation of body fat, just one of many exercises in determining one's physical fitness, had as its main objective a review of percents.

Special attention was focused on increasing each girl's knowledge of and skills in using the computer. The target schools all have computers available for classroom use, yet most of the participants were avoiding the computer. To enable the participants to practice their new-found skills during the program, the focus on computers came early. The Pacific Science Center has 10 computer terminals, and as the girls' skills increased, they began to arrive early to use the computers before the Center opened to the public. This component of the program was by far the most popular, which is of note because some programs to get girls interested in computers are meeting with mixed success.

The sequencing of the computer work was critical. The girls first worked in teams attempting to discover optimum strategies for the computer games "What's My Number" and "Trap Me." "What's My Number" involves discovering a secret number between 1 and 100. Students could ask questions of the form, "Is it greater than 50?" to which the computer replies "yes" or "no." Theoretically, the number can be identified in seven questions. "Trap Me" is a sophisticated variation of "What's My Number." After working at the terminal, the strategies of the two games were discussed and analyzed, and more advanced games were introduced. On day two, the girls simulated the workings of a computer. The staff believes it was this simulation that freed the girls from their "fear of the computer" and enabled them to realize that they were in control. This belief, based only on observation and anecdotal material, needs to be further investigated. This simulation was followed on days three and four with individual help in programming both analytical and figural problems.

Girls appear to perform less well than boys on tasks involving spatial components, and this lack of spatial ability is highly correlated with poor performance in mathematics (Fennema and Sherman 1977). Cook and Kersh (1980) have developed a program for improving performance on spatial tasks, a mini-version of which was incorporated into the Math for Gifted Girls curriculum. Again, sequencing is important. The work began with two-dimensional (2-D) tasks of visual imagery--tasks involving no mental movement of the created image--followed by tasks involving mental rotations of 2-D objects. These, in turn, were followed by visual imagery of three-dimensional (3-D) objects and mental rotations of 3-D objects. The final task involved constructing 3-D objects from a series of 2-D representations.

Opportunities for discussion on career aspirations presented themselves frequently during class discussions, during lunch, and in connection with the continual questions regarding the personal lives of the staff. Not only was the entire staff female--to insure ample role models, but also field trips involved meeting female scientists on the job.

Two components of the curriculum not obvious from the list of curriculum activities in table 1 are a focus on problem solving and a sequence of activities from concrete to symbolic. Problem solving was integrated into all

components, either through the curriculum itself, as with the logic games and the instant investigations, or through the employment of a problem-solving methodology, as in the case of improving spatial skills. All activities included the manipulation of concrete objects ranging from pattern blocks to computer terminals. The emphasis was on learning by doing. A common complaint associated with this strategy of instruction is that, while "the doing" is fun and the students like it, "the doing" is never related to the symbolic--to paper and pencil mathematics. This critical relation between the concrete and the symbolic was built into the curriculum through the sequencing of activities, beginning with work at the concrete level, followed by relating the concrete work to the symbolic, and ending with work at the symbolic level only.

The girls' parents were invited to participate in two evening sessions. The first session, held before day one of the program, was to acquaint the parents with the program and its staff. The rationale for the program was explained, as was the method of how their daughters were chosen. A second session was held near the end of the program to share with parents the activities in which their daughters had been engaged. Parents were invited to share ideas and suggestions for increasing their daughter's interest in mathematics, as well as ideas and suggestions for improving the program.

As noted, the program had three goals: to increase gifted girls' awareness of the usefulness of mathematics, to increase their confidence in their mathematical ability, and to increase their ability to do mathematics. The following is a discussion of each goal, and of the participants' evaluations of the program.

The Fennema-Sherman Attitude Toward Mathematics Scales (Fennema and Sherman 1976) were used to assess levels of both usefulness and confidence. The girls were visited at their schools during the week before the program, at which time the first assessments were made. A second assessment was made during the last day of the program. The preassessment scores of usefulness ranged from 2.59 to 4.17 on a scale of 1 (little awareness) to 5 (much awareness). The mean rating was 3.24. The postassessment ranged from 2.50 to 5, with the mean rating being 3.55. The increase in usefulness as measured by the pre- and postassessments was significant at the .025 level (see Table 2). The Fennema-Sherman Scales are counterbalanced in regard to positively and negatively stated items. Of interest is that the greatest increase in usefulness was seen on the negatively stated items, such as "Taking math is a waste of time." Although increase occurred on positive items such as "I will use math in many ways," even greater increase was seen in the reduction of the magnitude of response to the negative items.

The responses to the pre-assessment of confidence ranged from 1.75 to 3.83 on a scale of 1 (little confidence) to 5 (much confidence). The mean response was 2.97. The responses on the postassessment ranged from 1.33 to 4.0, with the mean response at 3.02. There was little overall increase in confidence, and much variation in response. Some of the girls increased in confidence, while others showed a decrease as measured by the assessments. Two possible explanations might account for the observed results. The girls could have actually decreased in confidence, which would not have been surprising. Although these girls did not perform well on standardized tests of mathematics, many were receiving A's and B's on classwork. The emphasis in the program was on the conceptual aspects of mathematics as well as on problem solving, two components of mathematics in which one cannot rely on short term memory alone. These girls, when confronted with such mathematics, might have begun to be aware of their inabilities and actually decreased in confidence.

TABLE 2

MEAN ATTITUDES TOWARD MATHEMATICS

Fennema-Sherman Mathematics Attitude Scales	Preprogram Assessment	Postprogram Assessment	t (1)	p
Usefulness	3.24	3.54	2.50	.025
Confidence	2.97	3.02	.51	m.s.

(1) Paired--t Statistic

If this was the case, a program spread over a longer period of time is required to allow staff the time to rebuild and nurture the girls' confidence.

However, another explanation is more credible. When first assessed, the girls could not afford to let the staff "know of their shortcomings"--their lack of confidence--and answered the questions as "they thought they should." As their rapport with the staff developed, the girls could afford to be themselves and honestly confess to a "lack of confidence" (as they did in class as the program progressed). In the future, it is recommended that new participants' attitudes be assessed by school personnel rather than the Math for Gifted Girls staff.

The Seattle School District uses the California Achievement Test (CAT) to assess students' performances in both fall and spring of each year. Because girls would be expected to do better in the spring than in the fall, even in the absence of a Math for Gifted Girls program, a control group was selected and the mean difference between the fall and spring CAT scores for the participants was compared to the mean difference between the fall and spring CAT scores for the control group. Each participant was matched to a control in terms of sex, grade level, mathematics performance, and language arts performance.

The difference scores (the difference between the spring and the fall CAT scores) in mathematics applications for the participants ranged from -8 to +21, with the mean difference being +3.07. The difference scores for the matched controls ranged from -25 to +14, with the mean difference being -2.64. The difference in the mean scores neared significance $p < .10$ (see Table 3). The difference scores in language arts for the participants ranged from -8 to +8, with the mean difference being -0.79. The difference scores for the control group ranged from -7 to +12, with the mean difference being 1.36. The difference between the means was not significant, $p > .30$.

TABLE 3

MEAN DIFFERENCE SCORES OF PROGRAM PARTICIPANTS AND MATCHED CONTROL GROUP

California Achievement Test	Program Particiants	Matched Controls	t (1)	p
Mathematics Applications	+3.07	-2.64	1.60	.10
Language Arts	-0.79	+1.36	0.98	m.s.

(1) Difference between two means

Implications for Gifted Education

Many gifted girls are unknowlingly limiting their career options by avoiding mathematics. Although this syndrome is blatantly obvious at the secondary level when the study of mathematics becomes optional and gifted girls opt not to study it, the syndrome begins to surface in the middle school years when the study of mathematics is still mandatory. The middle school girls are enrolled in mathematics courses, but many are in them in body only--emotionally and intellectually they are avoiding mathematics already.

In part, the avoidance is created by social constraints placed on adolescent females. Many young females are unaware of the relevance of mathematics to a full career choice; many lack confidence in their abilities to do well in mathematics; and many adolescent females believe that it is not feminine to do well in mathematics. Mathematics teachers of gifted students can counteract the problems of mathematics avoidance by adapting some of the techniques used in the Math for Gifted Girls Program.

The Math for Gifted Girls staff recognized and dealt with the affective component in teaching and learning mathematics. Mathematics, even more so than most subjects, is considered an intellectual endeavor. When students do not do well in mathematics, too often the assumption is made that the lack of success is due to some intellectual malfunctioning. Little attention is given to the emotional component involved. The Math for Gifted Girls staff attended to the female adolescents' social and emotional needs in relation to mathematics. Much time was spent in discussing the feelings associated with success as well as failure and, more importantly, the fear associated with mathematics learning.

Because these topics do not lend themselves to large group discussion, a large mathematics class could break into small groups for such discussion, or one small group could discuss such issues with a school counselor while the rest of the class is working on other projects. These discussions should be

done on a regular basis. Students should not be singled out for such discussions, but rather all students should have the opportunity to talk about their feelings associated with mathematics learning, particularly in relation to future career choices.

The Math for Gifted Girls Program was for gifted girls only. It is both infeasible and even undesirable to offer all-girl mathematics classes, but group work within classes that include, but are not restricted to, all-girl groups is practical. That is, female adolescents should be given the opportunity to work with an all-girl group, and should be included in some of the discussion groups mentioned above. Again, students should not be singled out for these group assignments, but group work should become a natural, integral part of the classroom format.

The computer work was by far the most popular part of the Math for Gifted Girls Program. The girls openly voiced how they enjoyed the computer when the boys were not around. Computers are becoming standard equipment in most middle schools and girls, including gifted girls, are avoiding them. Computer use is usually on a voluntary basis, thereby allowing girls not to use them. Rather than single out gifted girls in an attempt to get them involved with the computer, time on the computer should be made mandatory, and girls should be initially assured of time on the computer working with other girls. They should be allowed time on the computer without the threat of looking either "too smart" or "too dumb" in front of adolescent boys.

In summary, gifted adolescent girls cannot be allowed to continue to avoid mathematics. They must be made aware of the necessity to study mathematics; they must be helped to develop and nurture self-confidence in their abilities to do mathematics; and until such confidence is fully developed, special opportunities for all-girl-group work should be an option that is frequently available to them in their day-to-day mathematics classes.

REFERENCES

Armstrong, J.M. Achievement and Participation of Women in Mathematics: An Overview. Education Commission of the States, 1980.

Bar-Tal, D. and Frieze, J.H. "Achievement Motivation for Males and Females as a Determinant of Attributions for Success and Failure." Sex Roles 3 (1977):301-13.

Cook, N., and Kersh, M.E. "Improving Teachers' Ability to Visualize Mathematics." In Proceedings of the Fourth International Conference for the Psychology of Mathematics Education, edited by R. Karplus. Berkeley, Calif.: University of California, 1980.

Deaux, K. "Sex: A Perspective on the Attribution Process." In New Directions in Attribution Research, Vol. I, edited by J. Harvey, W. Ickes, and R. Kidd. Hillsdale, N.J.: Lawrence Earlbaum Associates, 1976.

De Wolf, V.A. High School Mathematics Preparation and Sex Differences in Quantitative Abilities. Seattle, Wash.: University of Washington Assessment Center, 1978.

Fennema, E.; Reyes, L.H.; Perl, T.H.; and Konsin, M.A. "Cognitive and Affective Influences on the Developments of Sex-related Differences in

Mathematics." A symposium presented at the annual meeting of the American Educational Research Association, 7-11 April 1980, Boston, Mass.

Fennema, E., and Sherman, J. "Fennema-Sherman Mathematics Attitude Scales." JSAS Catalog of Selected Documents in Psychology, 6, 1 (1976):31 (MS. No. 1225).

_____. "Sex-related Differences in Mathematics Achievement, Spatial Visualization, and Affective Factors." American Educational Research Journal 14, 1 (1977):51-71.

_____. "Sex-related Differences in Mathematics Achievement, Spatial Visualization, and Affective Factors: A Further Study." Journal for Research in Mathematics Education 9, 3 (1978):189-203.

Fox, L.H. "Sex Differences in Mathematical Precocity: Bridging the Gap." In Intellectual Talent: Research and Development, edited by D.P. Keating. Baltimore, Md.: Johns Hopkins University Press, 1976.

Haven, E.W. "Factors Associated with the Selection of Advanced Mathematics Courses by Girls in High School." Research Bulletin of the Educational Testing Service. 72, 12 (1972).

_____. "Factors Associated with the Selection of Advanced Academic Mathematics Courses by Girls in High School." DAI, 32 (1971):1747A.

Keating, D.P. "Discovering Quantitative Precocity." In Intellectual Talent: Research and Development, edited by D.P. Keating. Baltimore, Md.: Johns Hopkins University Press, 1976.

Kreinberg, N. "Equals Summary Findings." Mimeographed. Los Angeles, Calif.: University of California at Berkeley, 1980.

Lantz, A.E. Determining the Importance of Factors Influencing the Selection of Mathematics Courses. Final Report to National Science Foundation; Grant SED 78-17103, 1980.

National Assessment of Educational Progress. The Second Mathematics Assessment, 1979.

Remick, H., and Miller, K. "Participation Roles in High School Mathematics and Science Courses." The Physics Teacher, (1978):280-82.

Sells, L. "High School Mathematics as the Critical Filter in the Job Market." In Developing Opportunities for Minorities in Graduate Education. Proceedings of the Conference on Minority Graduate Education, 1973, University of California at Berkeley.

_____. "Math Avoidance in Women and Minorities." Unpublished manuscript, University of California at Berkeley, 1980.

CLINICAL OBSERVATIONS AND ASSERTIONS ABOUT GUIDANCE OF GIFTED CHILDREN

by Marshall P. Sanborn

Observations, research data, and illustrative examples presented herein are drawn primarily from experiences at the Research and Guidance Laboratory for Superior Students, University of Wisconsin, from 1957 to 1977. The Laboratory carried on a research-through-service program involving gifted and talented students, their parents, and their teachers and counselors in 90 cooperating school systems in the state. Participating were some 4,000 young people who came from large schools and small ones; from cities, suburbs, small towns, and farms; and from nearly the entire range of geographic, familial, and socioeconomic circumstances to be found in Wisconsin.

Founded on a tenet that adequate programming for the gifted child is a local school responsibility, the Laboratory goal was to develop practical procedures that local school systems could incorporate with local resources. A longitudinal sequence involving selection, appraisal, action, and revision, was designed to achieve this goal. Cooperating schools were enlisted with the understanding that they would continue in the program for several years. Typically, they did so for seven years, but some systems stayed with the program through the entire 20 years.

Participating students were selected in grade nine and continued until they were graduated from high school; in addition, most of them took part in follow-up studies after high school. Through the years the Laboratory generated data concerning a large number of gifted and talented persons from a wide variety of situations over a long time. This length and breadth of experience was a distinctive feature of the Laboratory.

Also distinctive was the nature of the experience. We were concerned with counseling the gifted and talented; with the guidance problems and issues that these students and their parents and teachers encounter; with providing personal assistance needed to solve problems, resolve issues, make immediate choices, and plan for the future on the basis of adequate knowledge about oneself and one's existing alternatives and opportunities. The Laboratory mission required a personal approach in all the avenues associated with a model counseling and guidance program: individual appraisal, systematic counseling, parent conferences, teacher consultations, case conferences, and the like. Although we were interested in discovering what we could about characteristic needs of gifted children and useful strategies for working with them in groups, we sought our information on a case by case basis. It is possible from case studies to translate some kinds of information into generalized statements, but the end result of any serious attempt at the case

method of study is the conclusion that human development is--after all--a highly individualistic process.

Perhaps most importantly, the Laboratory was committed to discovering and fostering personal, social, educational, and career needs of gifted youngsters who by majority standards were functioning well above that majority. We were asked constantly, "Why do you waste your time on these children when there are so many children in the schools who really need your help?" And we asked ourselves continuously, "What does this child really need from a guidance program?" Over time we encountered almost every kind of troublesome crisis one can imagine, but it is also true that these crises were not the daily fare of the Laboratory. We found ourselves working mostly on matters of positive development with a reasonably happy, healthy, energetic, active, productive, socially concerned group of young people who did well at the kinds of things usually assessed to estimate progress in school and in life.

This feature of the Laboratory population forced us daily back to the mission that school counseling and guidance was originally intended to serve--a developmental mission with remedial and preventive components that is aimed at maximizing every youth's education. Often in schoolwork this developmental component gets lost in the shuffle because situations requiring immediate attention upstage all other activities. No such pattern developed at the Laboratory, however, and we were free to think about guidance idealistically.

Although we could think in ideal terms, our actions were tempered by practicality. Ultimately, we had to translate principles into practices amenable to the resources of local school settings where student-counselor ratios averaged 300 to 1. Detailed discussions of the Laboratory program available elsewhere (e.g., Rothney and Sanborn 1966; Sanborn 1977) describe a guidance program of 150-200 minutes per student per year. These minutes divided into two 45-minute scheduled interviews per year; one 45-minute parent conference per year; a few minutes per year per teacher in teacher consultation; miscellaneous referrals to resource persons; miscellaneous arrangements for use of resource facilities; and paperwork associated with cumulative records and correspondence. In addition, all students spent a few hours per year completing standardized and nonstandardized appraisal instruments, interpretation of which was done during the counseling, conference, and consultation sessions.

What, of Significance, Can Come From 200 Minutes a Year?

The contact time represents the upper limits for a school counselor who provides reasonably equitable attention to every student, is well-organized, works hard, and is free of irrelevant and unproductive work assignments. To be fruitful this time must serve as a catalyst leading to student, parent, and teacher action beyond the scope of the counselor to achieve. However, at the point of attempting to stimulate action, we encountered some of the most perplexing problems we had.

We were interested in getting particular people to try to meet particular needs of particular children. From our case studies it was obvious that every child had developmental needs. However, if those needs did not conform to some stereotype of gifted children as a group, then likely they would go unmet. Much thought and investigation may have gone into differentiating a child as gifted, but not into differentiating a child among gifted. Gifted children are different from each other in more ways than they are alike, but

it seemed to be assumed that a gifted child is not a particular child. Instead, he or she is a particular kind of child.

In the vernacular of teaching, gifted children are often called "fast" students or "accelerated" students. However, some gifted persons turn out remarkable performances best at a slow, methodical, meticulous, patient, painstaking, thoughtful, thorough, exacting, persevering pace. To think of them as "fast" is to seriously misconstrue their styles, needs, and potentialities. Other myths, too, seemed to be powerful deterrents at points where individual qualities needed to be recognized and acted upon.

Along with other researchers, the Laboratory to some extent contributed to these myths. In studies on identifying and describing gifted children, we have concentrated on the things they have in common.

Twenty Years of Research

Some 80 reports have been published about Laboratory subjects. These papers have been classified under the following general topics: identifying gifted children, methods of individual appraisal, descriptive studies, classroom and curriculum provisions, counseling and guidance procedures, and post-high school choices and achievements (Sanborn, Pulvino, and Wunderlin 1971). Rather than review specific research methods and findings here (see Additional Selected Readings), attention in this paper focuses on the methodological features of Laboratory research that may contribute both to knowledge and to myth about the gifted.

Much of the material emanating from the Laboratory was dimensional data. Like others in our field, we tried to generate group data useful for identification, classification, prediction, and generalization. Like others also, I suspect, we found it handier to collect, organize, interpret, report, and defend dimensional information than to perform similar operations with morphogenic material examining form and structure.

At a practical level, we tried to provide model counseling and guidance services to individuals. We used the raw data generated from those sessions for research and evaluation. Although a variety of data collection methods were used, we learned to place high value on morphogenic data obtained through direct work with students. The meaning of any piece of information is a function of its place in an intricate pattern of information. There may be norms for any datum, but there are no norms for the pattern, nor for the context in which the pattern developed. Each pattern is irreplicable, and as such fails to qualify by common scientific standards of replicability.

For this reason, specific items of information have often been extracted from the context of case study research, classified, scored, categorized, and eventually reported in dimensional terms. Because analysis of free-response material characterizes counseling research, the problem of losing valuable information in dimensional reporting is ever present. The following examples illustrate the problem.

At the Laboratory we wanted to encourage each child to develop a point of view about his or her past experiences and contacts, as these might have been foundational to present development and future plans. We decided to use a series of impromptu personal essays that might yield useful research information and simultaneously help children develop habits of self-investigation. Personal essays allowed them to think about themselves, using tools they ordinarily have at hand--their experiences, their thoughts, attitudes, aspirations, and their modes of written self-expression.

From all ninth graders in the program we obtained essays entitled, "The Dominant Forces that have Influenced My Life." Under controlled conditions, students had one hour to write on this topic. They were asked to keep the following questions in mind as they wrote: "In what ways have certain persons influenced my life most? What other factors have caused me to be the person that I am? How will these influences aid or hinder me in attaining what I hope to become?"

No two essays were remotely alike. They ranged in length from a single sentence ("God put me on earth for some reason which I have not yet discovered.") to more than 1,000 words, and they showed wide variation on any criterion we applied. Below are two examples, unedited except for names:

Mary--Age 13

> The persons who had the most influence on me are my parents. This is natural because they are the ones I have associated with more than anyone else. From them I learned how to tell right from wrong. I learned some good habits and some bad ones. I imitated them as a child and I admired them as I got older. They seem awfully stupid at times, but I'm told that all parents go through this stage.
>
> I have been fortunate to have trustworthy friends. Once in a while we have done mischievous things but we have never been destructive or mean, and my friends have always respected me even when I did not do what they wanted me to. We have a lot of fun, and in the summer we often go to Doc's Pond to swim--a welcome relief on a hot day.
>
> We have interesting neighbors who live right across the street. Their girl is three years older than I and has helped me prepare for every stage in my life so far. When I was four she took me to visit school. Later she took me to visit high school. She tells me in detail about her dates. Her mother gives parties for teenagers, and I would say that it is over there that I have learned the facts of life. I don't mean to say that my own home does not attend to these things. What I do mean is that across the street there is first-hand knowledge. Even so these people remain good friends of my family and me.
>
> Living in a small town has influenced me. I know just about everyone in town, and just about everyone knows me. When someone is pointing me out they say, "There's the Hjelmstadt girl--the one with the three smart brothers." I have a lot to live up to, and sometimes it's frustrating when I don't do as well as they did.
>
> All in all, I'd say I have had an easy, happy life. I have never encountered any real tragedies. There have been minor disappointments, but I have had a good time. I am looking forward to my four years of high school and then college.

Does this essay call up any particular picture--any kind of flavor--that is unique? She mentions parents, as many children do, but is there anything about her comments that bespeaks of a special kind of parent-child relationship? She mentions friends, but in a way unlike any other person whose essay we read. Now for another:

Mark--Age 14

I think the forces and factors which have most profoundly influenced me are the unfortunate events of my family life, two of my teachers, the time and general environment in which I was brought up, and the fact that I was handicapped as a result of a birth defect.

In discussing the effects of several unfortunate events I think that one thing I have gained from them is a personality that is able to withstand severe pain and strain. My life, up to the time of my mother's death, was largely uneventful except that in this time surgical operations, orthodontic treatment and speech therapy helped me to overcome my birth defect--a cleft pallet (sic). At the time of my mother's death I think that I gained a great deal of faith in God. The remarriage of my father several years following the death of my mother I think of as a transition period in which I learned about the great happiness of marriage. This was a period of "relative happiness" which ended recently with the divorce of my father and stepmother. I then lapsed into a period of depression. The only really good thing to come out of it was that I am presently stronger, more flexible, and better able to adjust to unfavorable and unhappy situations. As a result of this, I think I know how to take disappointments in stride.

My understanding of the responsibilities of leadership and the workings of a democracy has been furthered greatly by my Student Council Advisor, Mr. Montgomery and my Principal, Mr. Stephansson. I have learned many object lessons from these two men. I have learned how to be subordinate, that there are times when nothing is said, and that there is necessity for cooperation and good reporr (sic) between all parties involved in an issue if anything is to be accomplished. Also I believe Mr. Stuart has taught me the meaning of patriotism and the meaning of the phrase "never give up." Together, in summary, I would like to say that these three men have shown me how to respect authority.

Obviously my family background would have a profound effect on my personality and my set of morals and values. My thinking, by virtue of my background, has given me a tendency to dislike labor unions and favor management, to support the Republican party, to hold conservative views, and to be outspoken--to stand up when the situation demands it--at times.

My birth defect, already having been discussed in a previous paragraph, is the last major factor which has greatly influenced my life. It has been a handicap, to be sure, but in another respect it has given me something to work for. It has given me something to prove--that I can lead a normal life and that I can excel in anything I desire, regardless of the defect. It has further helped me in understanding the problems and goals of others.

It seems unnecessary to point out the ways in which this somber statement reflects a very different life experience from that which Mary seems to have had. Even a cursory examination of other case materials regarding the two youngsters will reveal important ways in which they are unique with respect to each other and with respect to other adolescents.

What do we do with this kind of material in research reporting? Within

usual time and space limitations, we can illustrate at best some of the uniqueness we find in children--uniqueness that has important implications for those who guide and educate them. Then we must hope that readers will generalize from the illustrations, but that is an uncertain hope. I submitted another paper (Sanborn 1979) in which case data about Mark was contrasted with data on another boy to illustrate how two people who performed alike could need very different school experiences. Editorial consultants suggested that in choosing Mark for an example I had made a bad choice, because one would not ordinarily expect a person "of his type" to behave as he did. So it goes.

A more certain way to proceed is to resort to some system for presenting the qualities individuals have in common. The more often a thing can be replicated, the more credible it becomes. With the essays we set up style, form, and content categories with a view to scoring the essays in terms of existence of types of content. Both amount and kind of content were scored. For example, the mention of adult members of the family was one category. About 97 percent of the ninth graders had something to say on this topic. From these, we further broke down comments into positive, negative, ambivalent, and descriptive categories. We performed similar operations with 12 other content categories, and generated norms to show what ninth graders typically talk about. With variations, we applied this same logic to other free-response material (e.g., Cody and Rothney 1963; Koopman 1964; Mueller and Rothney 1960; Rothney and Sanborn 1965). Mark and Mary's data are included in these research reports, but Mark and Mary are lost, dismembered, and dimensionalized. We know that they said something, but we do not know precisely what they said, or why they said it, or what their remarks might offer the people who teach them.

This kind of research procedure is an honorable one and a useful one for some purposes. It is possible to make sense out of some kinds of data only through reference to dimensional knowledge. For example, a 3.6 million-year-old set of footprints in Africa can be called human only because anthropologists have done the dimensional legwork necessary to know how human footprints are alike (Leakey 1979). To classify them as human they must be typical. If whoever made those prints had, by reasons of a birth aberration or a maiming of some kind, left unusual prints behind, we could never call them human by means of dimensional logic.

If we want to identify a <u>particular</u> human by means of footprints (as is sometimes done on birth certificates), we must learn to assess ways in which footprints differ. When the difference makes a difference, this kind of technology becomes important.

Assertions about Giftedness

Most processes for identifying gifted children are based on dimensional logic. We say what gifted children are like, and then we look for children like that. Most processes for the study of gifted children are also based on dimensional logic. We collect data from groups of subjects and by empirical or logical means, we develop classes or categories into which all (or most) data will fit. In both identification and description, the data that fit are included and the data that do not are excluded. Once excluded, neither a person nor a datum has further effects on our thinking.

In this manner, Marks and Marys can get lost even after they have been found. Certain of their qualities have been discovered during the identification process, and certain others during description, but essential

qualities--perhaps the only ones that might make a difference in what educators do--have not been brought to light.

The reason for identifying a child as gifted is to depart from common practice to meet the needs of an uncommon child. We cannot do this satisfactorily on the basis of what the child has in common with uncommon children. Serious case study reveals that nearly any gifted child is uncommon among the gifted, and at the same time common among the ungifted. We can learn better how to deal with both the common and the uncommon, the gifted and the ungifted, if we will rethink from time to time our own common beliefs. The following assertions are intended to stimulate another look at some foregone conclusions that seem to me to be common among educators.

1. Gifted and talented children are whoever we say they are. The terms "gifted" and "talented" seem to imply that the individual has some qualities that were inherent from birth. Although it may be true that certain potentialities are inborn, the things we look at to assess giftedness are not necessarily inborn capabilities. Instead, they are things we have decided to use as indices of inborn capabilities. They are arbitrary criteria. Methods of assessment may have logical or empirical histories, but the criteria themselves are arbitrary. Even when multiple criteria are used they do not cover the developmental possibilities that children have. Further, regardless of a child's potentialities, he or she will not be identified unless somehow those potentialities are expressed in ways that we value.

Early procedures for identification involved few criteria. Lewis Terman, for example, decided during the 1920s that his gifted female students should rank in the highest one percent on intelligence test performance. Consequently, his subjects had IQs of 135 or higher (Sears and Barbee 1977). Present day procedures usually include both objective and subjective assessments of a wide range of cognitive, creative, social, artistic, and psychomotor behaviors. The effect has been to broaden the general category of gifted and talented children, to deemphasize the weight of any single criterion, and to build subcategories of persons who are gifted or talented in this respect or that.

Part of the development toward multiple criteria has come about through theoretical and technical changes in the past 50 years. The work of Piaget (1950), Guilford (1967), and other theorists has enabled educators to conceptualize giftedness as a complex set of intellectual, emotional, and psychosocial factors. We can better decide now what behaviors to observe and better hypothesize about the meanings of those behaviors. The burgeoning of mental assessment devices has given us a greater variety of tools for use in obtaining aptitude, achievement, creativity, psychomotor, and critical thinking scores. Also, there has been productive thinking about how to incorporate systematic behavior observation in identification procedures (e.g., Renzulli and Hartman 1971). In short, we are more able now to identify gifted and talented children.

Another part of the development seems due to changes in social values and heightening public awareness of shortcomings involved in traditional criteria and assessment methods used in education and in the world of work. Current identification procedures incorporate not only more criteria and a wider variety of assessments, but also more flexibility, broader valuing, and more points of view than have been used in the past.

In other words, we are more willing to identify giftedness than we used to be. The kinds of things we are willing to call "gifts" and the kinds of information we are willing to consider in the identification process may

account for the most significant changes in gifted child populations during the past few years.

It has been interesting at the Laboratory to observe the role that values play in identifying the gifted. We developed a set of multiple criteria for schools to use in selecting Laboratory participants. School faculties were trained to use the criteria and regular follow-up discussion was pursued to advertise the effects of criteria use. These instructions and criteria are crude and narrow today, but they were innovative for 1957. They encouraged broad participation of school staff, use of judgments on the basis of observed behavior, consideration of interests and preferences as well as products, attention to behaviors reflecting creative and critical skills, and awareness of reactions of others to the individual. Test scores and school grades were deliberately deemphasized, although it was agreed that persons who showed some combination of the criterion behaviors would also usually get high scores on tests and good marks in school (Sanborn, Pulvino, and Wunderlin 1971).

Notwithstanding commonalities in the total Laboratory population, there were noteworthy differences among groups from different schools. One school unerringly sent youngsters who would eventually occupy top ranks in their graduating classes. Another sent a fair number of people who could be described as "creative." Some schools sent "problem" students who seemed to be out-of-step with their age mates. There was variety both within a school group and between school groups. Part of this could be attributed to variety in school populations from which the children were drawn, but not all of it. Over the years, both through observation of the students and through contact with the people who selected them, we learned to associate certain types of student groups with certain schools. All schools used the same criteria, but no two used them the same way. Values of the selectors had much to do with who got chosen, and it seemed obvious that a person thought to be gifted in one school might not be considered gifted in others.

There are two important reasons to remind ourselves that the identification of any gifted child is a value judgment. The first is to promote openmindedness at selection time, an activity in which significant gains have been made during the past decade. The second reason is to promote openmindedness after the child has been selected. We have not made as much progress in this respect as is needed.

What do we do about the unvalued aspects of a child who has been called "gifted" on the basis of values? What are we likely to do when aspects valued at the time of selection prove in the long run to be detrimental to needed development? What do we do when it is discovered that valued accomplishments and skills are best developed in unvalued ways? It seems often the case that when such events occur people retreat to dimensional logic. Either they disqualify the child as "gifted" or they disqualify facts about the child as irrelevant. Such reactions might be less likely to occur if it is recalled that educators operate on the basis of their values, and not necessarily on the basis of essential facts about the child.

2. Gifted children have as much in common with other children as they have with each other. Gifted children are different from each other in more ways than they are alike. On the other hand, being human, they are similar to other children in more ways than they are different. Any one individual presents a complex pattern of experiences, interests, attitudes, motives, capabilities, limitations, values, relationships, and needs. Educators must learn to capitalize on all of these qualities to identify and meet the needs of the child. In some respects, the qualities and needs of a gifted child

will resemble those of other gifted children, and in other respects they will resemble those of just plain folks.

A gifted child is an individual usually developing on a number of dimensions at once. On some dimensions the child will seem ahead or beyond agemates; on others behind. Educators must become aware of all the dimensions, because failure to develop one may retard development on others.

3. Giftedness is the result of a life process. Behind nearly every accomplishment of a gifted person, there is a history of learning and development that began with opportunities and reasons. If we are interested only in discovering the gifted, this history is unimportant, but if we wish to foster giftedness, an understanding of its development becomes crucial. It is crucial, both for those who have been called gifted and for those who have not, to set up conditions wherein giftedness is likely to flourish.

One kind of giftedness currently being identified is called "kinesthetic" or "psychomotor" giftedness. It may be of interest to pay attention to the developmental histories of persons identified as kinesthetically gifted. Certain processes of their development may be easily observed, and through such observation we may become better equipped to understand life conditions under which a variety of forms of giftedness may develop. We have no ready way to track development of certain mental or imaginational abilities, but there is no good reason to believe such abilities are not developed by processes similar to those that support superior kinesthetic performances.

For example, one gifted athlete of whom many people have become aware is Olympic speed skater Eric Heiden. To win five gold medals in a single Olympic session, he must be gifted, but what are those gifts? Perhaps a person who watched Eric grow up would say that he was blessed with a healthy body, a northern climate (Olympic speed skaters never come from tropical climates), a community in which skating is a popular sport, access to good skating facilities and programs, a peer group of fine skaters, friends and relatives who encouraged him and set good examples for him, superb coaching, and a ten-speed bike. Eric had health, opportunity, environment, relationships, resources. The rest was all work, and only because of that work has the world heard from Eric Heiden.

Almost every day of the summer of 1979 Eric rode his ten-speed bike to the Olympic style speed skating facility where he spent several hours in hard practice before riding his bike home again. This may not seem noteworthy until one learns that the rink was not in Eric's home town of Madison; it was in West Allis, some 70 hot, hilly, windy miles away. The 140 miles per day plus several hours' practice was no gift. To become a gold medal winner, Eric had to want to become one very much.

Is it wild speculation to suggest that other forms of giftedness may reflect these same kinds of gifts--opportunity, environment, resources, relationships, desire, work? On the road to the theory of relativity, Albert Einstein did not do much visible huffing and puffing, but he worked at it for a long time. Inventor Thomas Edison once said that "Genius is one percent inspiration and ninety-nine percent perspiration." Pianist Van Cliburn said about his development, "I found at an early age that I was intensely interested in the piano and was willing to spend several hours every day in practice." Another pianist, Artur Rubenstein, once said, "If I miss a day of practice I can tell. If I miss two days my friends can tell. If I miss three days, everyone can tell." Psychologist Vern Bullough (1980), after studying life histories of a large number of noteworthy achievers, observed that creative inspiration is likely to be going on early in life, but it is usually

not recognized until after a long period of continual repetition.

Experiences at the Laboratory support this idea. Whether the pursuit is mathematics, art, writing, basketball, mechanics or whatever, the gifted child usually reveals a history of interest and effort. Some years ago we went to a group of professional artists and asked them to dig through their attics and memorabilia to find examples of artwork they did when they were very young. We obtained a number of samples and took them to other professional artists. Without telling them where we got the samples, we asked them to comment. We were looking for some evidence of talent, but we did not find it in quality of product. Instead our judges observed the tendency of these children to try things again and again.

When we identify gifted persons, we do not do it on the basis of observed raw potential. We observe performances or products and then infer giftedness. It is doubtful that we will ever have a better method of identification, but we can develop better ways to decide what to do about giftedness if we will remind ourselves from time to time that behind any product there is a process, and it is the process that has led to the product we observe.

4. The development of giftedness depends on excitement. A most interesting model for understanding developmental potential is provided by a former Laboratory staff researcher, Michael Piechowski (1979). He contends that most concepts of giftedness overemphasize cognitive components and underemphasize other essential components of development. During his years at the Laboratory, he collected data to illustrate five forms of psychic overexcitability--psychomotor, sensual, emotional, imaginational, and intellectual--which underwrite development. These five forms may be thought of as modalities through which the individual experiences the world and expresses the self.

Piechowski used the term overexcitability to refer to a "special kind of excitability...over and above what can be considered common" (p. 28). He suggested that any or all forms of overexcitability can exist in the individual independently. An individual with high levels of excitability in most or all modalities may have a greater abundance of experiences than an individual with low levels in most or all modalities. Also, the individual will reveal a wider variety of forms of self-expression. Piechowski believes that these various forms of overexcitability constitute the primary "original equipment" (p. 29) with which the child enters the world.

Whether or not any kind of overexcitability we can observe is original equipment, we may assume that it is functional equipment. The capacity to become excited and to express excitement can be associated with noteworthy accomplishments of many Laboratory participants. Further, it is possible to associate certain kinds of excitability with certain children.

School and social practices tend to ignore and sometimes to suppress both absorption and expression of some modalities. Psychomotor, sensual, and imaginational modalities usually must give way or be regulated away in favor of cognitive approaches. Now we are willing to recognize cognitive, psychomotor, and imaginational giftedness, but has anyone yet heard of an emotionally gifted child? Or a sensually gifted child? Perhaps the development of such persons as Henry Fonda, Ethel Barrymore, William Jennings Bryan, or William Shakespeare requires a fair degree of emotional excitability. Perhaps Helen Keller and her gifted teacher depended more than anything else on their sensual overexcitabilities and their emotional responses to each other. Yet, emotionality and sensuality are not well attended to in our thinking about the gifted.

The case of one eleventh grade boy in the Laboratory illustrates the problem. Considering his verbal ability, his low grades in English seemed puzzling, so we requested some of his thoughts on the matter. He wrote us a long letter, a portion of which follows:

> Poetry and literature have to be an...experience unique to each individual, so that nothing "is" great, but all things "are" great--relatively. If anyone can really feel anything from reading "Trees," which is a "lousy" poem, then they feel it. The teacher's job should be to make the student aware of his own feelings--to free him from thinking that he ought to like anything simply because he should like it.... The teacher can help by providing a context, a point of view, a logical analysis, but the poem itself comes from inside the individual--each unique experience never the same again even for the same poem and the same individual.... I can't weep for Adonis, but I did weep for the Nez Perce Indians when Chief Joseph surrendered in Harvey Chalmers' Last Stand:
>
> > "I am tired of fighting. Our chiefs are killed. The old men are dead. It is the young men who say yes or no.... It is cold and we have no blankets. The little children are freezing to death. My people, some of them have run away to the hills and have no blankets, no food; no one knows where they are--perhaps freezing to death. I want to have time to look for my children and see how many of them I can find. Here, my chiefs. I am tired. My heart is sick and sad. From where the sun now stands I will fight no more, forever."
>
> I write all this out to show that it is not necessarily the poetic that has power. It can be almost anything in a context where emotion is allowed and there is a personal meaning.... Whatever the facts were, I don't know. But I know how I felt.

Perhaps this boy has made the point. We need to learn how to allow boys and girls the capabilities they have, and to believe in their capabilities. Once we have identified them as gifted, we usually have yet to learn how they got that way.

In a Good School Guidance Program...

In a good school guidance program, the mission is to help youngsters learn about themselves and about opportunities and alternatives in their environment, so that they will be well-equipped to make choices or decisions. Good guidance people have the interests, the mission, the skills, and the tools to help children learn these things. At the same time, counselors can help a school learn about its children. Through guidance, suitable instruction can be derived for any child, particularly the gifted.

However, guidance alone is impotent; a guided program requires actions by others--particularly parents and teachers who have much control over the life experiences of the child. Gifted children, whether born gifted or not, become functionally gifted by virtue of opportunities, experiences, and above all, relationships that fit. To better insure good fit, it is necessary to maintain the viewpoint that educators cannot know a child merely by knowing children.

Over the years of Laboratory parent conferences--some 16,000 of them--we received thousands of comments from parents who were astounded at how much we learned about their child in the short contact we had, but nothing is mysterious about how we did this. We found that a counselor begins by wanting to know. Next, the counselor develops a system for knowing, preferably a system that helps the child to know, too (see Rothney 1968). Finally, the counselor accepts all that is learned.

We did this at the Research and Guidance Laboratory for Superior Students in Wisconsin, but people change and it must be done again. Perhaps, like Chief Joseph, we should go now and look for those children again--and see how many of them we can really, really find.

REFERENCES

Bullough, V. "Dissenting Thoughts on Intellectual and Creative Achievement." The Humanist 40 (1980):43-46.

Cody, J.J., and Rothney, J.W.M. "Oral Problem Solving Performances of Superior High School Students." Personnel and Guidance Journal 41(1963):425-29.

Guilford, J.P. The Nature of Human Intelligence. New York: McGraw Hill Book Company, 1967.

Koopman, N.F. "Evaluations by Superior High School Students of Their Oral Problem Solving Performances." Ph.D. dissertation, University of Wisconsin, Madison, 1964.

Leakey, M.D. "Footprints in the Ashes of Time." National Geographic 155 (1979):446-57.

Mueller, W.J., and Rothney, J.W.M. "Comparisons of Selected Descriptive and Predictive Statements of Superior Students, Their Parents, and Their Teachers." Personnel and Guidance Journal 38 (1960):621-25.

Piaget, J. The Psychology of Intelligence. New York: Harcourt, Brace and World, 1950.

Piechowski, M.M. "Developmental Potential." In New Voices in Counseling the Gifted, edited by N. Colangelo and R.T. Zaffran, pp. 25-57. Dubuque, Iowa: Kendall/Hunt Publishing Company, 1979.

Renzulli, J.S., and Hartman, C.M. "Teacher Identification of Superior Students." Exceptional Children 38(1971):211-14.

Rothney, J.W.M. Methods of Studying the Individual Child. Waltham, Mass.: Blaisdell Publishing Company, 1968.

Rothney, J.W.M., and Sanborn, M.P. "Verbal Skills of Superior Students." Final Report, Cooperative Research Project #S036, U.S. Office of Education, 1965.

_____. "Wisconsin's Research-Through-Service Program for Superior Students." Personnel and Guidance Journal 44(1966): 694-99.

Sanborn, M.P. "A Statewide Program in the Discovery and Guidance of Gifted Students." In Educational Programs and Intellectual Prodigies, edited by J.C. Stanley; W.C. George; and C.H. Solano, pp. 7-17. Baltimore, Md.: Johns Hopkins University Press, 1977.

_____. "Counseling and Guidance Needs of the Gifted and Talented." In The Gifted and the Talented, edited by A.H. Passow, pp. 424-38. Chicago: National Society for the Study of Education, 1979.

Sanborn, M.P.; Pulvino, C.J.; and Wunderlin, R.F. Research Reports: Superior Students in Wisconsin High Schools. Madison: University of Wisconsin Research and Guidance Laboratory, 1971.

Sears, P.S., and Barbee, A.H. In The Gifted and the Creative: Fifty-Year Perspective, edited by J.C. Stanley; W.C. George; and C.H. Solano, pp. 26-65. Baltimore, Md.: Johns Hopkins Press, 1977.

ADDITIONAL SELECTED READINGS

Alexakos, C.E., and Rothney, J.W.M. "Post-High School Performance of Superior Students." Personnel and Guidance Journal 46 (1967):150-55.

Atkinson, D.R. "Effect of Selected Behavior Modification Techniques on Student Initiated Action." Journal of Counseling Psychology 18 (1971):395-400.

Bradley, R.W., and Sanborn, M.P. "Ordinal Position of High School Students Identified by Their Teachers as Superior." Journal of Educational Psychology 20 (1973):209-13.

Davis, J.L., and Sanborn, M.P. "Getting Student Action on Guidance Goals." Journal of Counseling Psychology 20 (1973):209-13.

Hays, D.G., and Rothney, J.W.M. "Educational Decisionmaking by Superior Secondary School Students and Their Parents." Personnel and Guidance Journal 40 (1961):26-30.

Hoedt, K.C., and Rothney, J.W.M. "The High School Principal and the Superior Student." Bulletin of the National Association of Secondary School Principals 47 (1963):40-9.

Lewis, C.W.; Bradley, R.L.; and Rothney, J.W.M. "Assessment of Accomplishments of College Students Four Years After High School Graduation." Personnel and Guidance Journal 47 (1969):237-45.

Schatz, E.M., and Sanborn, M.P. "Some Pragmatics of Parent Consultation." Roeper Review, 3,1 (1980):40-3.

Smaby, M.H., and Sanborn, M.P. "Interview Involvement Procedures for Getting Action on Guidance Goals." The School Counselor 19 (1971):102-09.

GOALS, PROGRAMS, AND EVALUATION FOR EDUCATING GIFTED CHILDREN

by Robert A. Smith

Gifted children have been described as the birthright of the human race (Toynbee 1968), which would suggest that the education of these children should be of the highest concern to the body politic. However, according to Marland, "differentiated education for the gifted and talented is perceived as a very low priority at Federal, state, and most local levels of government" (1971, p. xi). It is posited that this lack of agreement between concern and priority can be attributed to a lack of internal consistency among the goals of those who educate the gifted, the programs designed to accomplish those goals, and the procedures used to measure accomplishment.

To set the stage, it is necessary to describe the results of gifted programs that several interested audiences expect. Following that description will be a discussion of the three discordant topics, with suggestions for points of compromise among the interested audiences. In developing these suggestions, I was constantly reminded of Broudy's dictum that, "Schools are promising far more than they can possibly do: The promise is a tribute to their good intentions rather than to their good sense. No science or combination of them can bail out such indiscreet hospitality" (1978, p. 107).

Audience Expectations

Every program is evaluated from the point of view of each interested audience. Given the nature of gifted programs, five audiences should be considered: pupils, parents, teachers, school districts (and by extension the community), and regulatory agencies. In evaluation, the concern is to place the program in such a position that each of the audiences will observe what they expect to observe.

Pupils. A major difficulty in discussing expectations of gifted programs is the identification of the target population. One of the educational journals reported that "between three and five percent of the school population is estimated to be gifted and talented" (1980, p. 6). Legislation for mentally gifted minors in California is more restrictive, providing for only the upper two percent in cognitive ability (California Joint Legislative Audit Committee 1978, p. 9). Burt points out that the issue may be even more complicated. He identified moderately gifted (to 150 I.Q.) and highly gifted pupils (above 150 I.Q.) with the comment that "a child of this latter type may be as much ahead of the majority of the gifted children as these are ahead

of the average child" (Burt 1975, p. 171). These confusing definitions of the composition of the gifted and talented population is one of the major hurdles in the development of school programs.

A second confounding factor is the continuing question of the interrelation of the various aspects of giftedness and talent. For example, the distinction between critical thinking and creativity is still open to question for many investigators, as is the contrast in a school setting between verbal ability and artistic ability. Every child is unique, and undoubtedly the best educational program would be individually tailored, but such individual attention in the public schools is economically infeasible. As a consequence, this discussion will focus on programs conducted in a group setting by the school district.

Given this restriction, it is of some interest to review student perceptions of gifted programs in terms of potential program goals and activities. Three of a number of studies are reviewed.

Barbe, as reported by Gallagher, found that the best-liked aspects of an ability grouping program in Cleveland were the opportunity to express individuality and the enrichment procedures. The least liked aspects were the attitudes of other students and teachers and the lack of social contact with other pupils (Gallagher 1975, p. 294). Burt reported that the three major criticisms of gifted pupils in London comprehensive schools are: no curricular provision for the particular topics in which they were specially interested, the time wasted in playing down to the dunces, and lack of teacher knowledge in special interest subjects (Burt 1975, p. 196). In a survey of gifted pupils identified by elementary and intermediate school in one California district, Wachter (1980) found the priority program goals to be: development of critical thinking skills, recognition of school accomplishment in terms of teacher evaluation, and identification of talents and abilities. These findings suggest that gifted pupils want the best of all possible worlds. They want the privileges to work at their own paces in subject areas with high cognitive content and to be liked and appreciated by their classmates and teachers. Given the structure of public education, these two desires appear to be mutually incompatible. For the students to work at their own pace and at the same time be liked and appreciated by their classmates would require an individualized instruction program not yet realized in public education.

Parents. Given parents' ultimate responsibility for their children's education and assuming their desires for the best education possible for their children, the lack of research on parents' expectations of a school program for the gifted is surprising.

The Gifted Child Society shared some insight onto the lack of expectation with the following:

> Precisely because the Society's parents didn't butt out and let the schools determine what was best and sufficient for the children, the Gifted Child Society grew to become one of the nation's largest nonprofit, parent-run organizations. It offers gifted children out-of-school enrichment while it continues to hope and work for the day when the public schools will do what is best and sufficient for the very bright and talented. (Ginsberg and Harrison 1977, pp. vii-viii)

The phrase, "best and sufficient," implies that public schools should do much more.

A second point, with respect to parental expectations, is well-stated by the Director of the National Association for Gifted Children in Great Britain:

> Many parents feel shame rather than pride if their children are exceptionally intelligent. Some children are even told to conceal their brightness by not trying in school, in case they are regarded as odd or different. One of the most mistaken ideas is that every parent wants a gifted child. Not a bit of it! They want clever children who will pass exams and keep them in their dotage. Except in the case of those who are themselves extremely able, parents tend to mistrust the gifted and the problems that can arise with them. (Collis 1972, p. 4)

These points suggest that an important educational concern of gifted programs should be parent education.

Teachers. The quasi-professional status of teachers presents a dilemma with respect to gifted programs. As professionals, teachers want to provide for individual differences, but as workers employed by a school district, they find it necessary to focus on their major assignment: management of a classroom for the schooling of a group of pupils. (See Smith and Geoffrey as summarized by Dreeben (1973) for an elaboration of this assignment).

The effect of gifted pupils on the management of a classroom is indicated by the comment that "the presence of a couple of pupils who are excessively bright can be more of a nuisance than half a dozen who are excessively backward" (Burt 1975, p. 196). In a similar vein, Wachter (1980) found that teachers' suggestions for gifted program improvement stressed development of tolerance for others and funding for special teachers.

In an analysis of student characteristics most appealing to teachers, Torrance (1965) provided further support for this observation: The most important characteristic was "consideration of others" and included such items as "industriousness," "sense of humor," "sincerity," "courteousness," and "doing work on time." Noticeably lacking from the list were such items as "independence of judgment" and "unwillingness to accept the judgment of authorities," both of which are typical characteristics of gifted pupils.

It is generally accepted that pupils markedly below the norm in terms of ability require more time and effort from a teacher. Such additional requirements are reflected in Public Law 94-142, the Education for All Handicapped Children Act, which provides financial support for assistance and special classes for these pupils. I will refrain from discussing the obvious and well-documented inequities in funding for these two markedly deviant (well above and well below the norm) populations (see for example Gallagher 1975, p. 291), but I would like to mention that in at least one instance (Denver, Colorado) the teacher contract includes a weight assignment greater than one for the handicapped child in the computation of class load. Perhaps a similar weighting procedure could be negotiated on behalf of gifted pupils (excessively bright are more of a nuisance than half a dozen who are excessively backward), thus recognizing the extra effort expended by classroom teachers.

School Districts. Goals of education are promulgated by every operating school district. As philosophical statements, they are important lodestones for the educational program. Typical is the following goal statement for one district.

TO HELP EACH CHILD:

A. Acquire to the fullest extent possible for him mastery of the basic skills in the use of words and numbers (reading, writing, math, language).
B. Acquire a positive attitude toward the learning process.
C. To understand and appreciate as much as he can of human achievement in the natural sciences, the humanities, and the arts.
D. Acquire good health habits in order that he might understand and maintain the conditions necessary for physical and emotional well-being.
E. Prepare for a world of rapid change and unforeseeable demands in which continuing education throughout his adult life should be a normal expectation.
F. Acquire the greatest possible understanding of himself and an appreciation of his worthiness as a member of society.
G. Acquire understanding and appreciation of persons belonging to social, cultural, and ethnic groups different from his own.
H. Acquire the habits and attitudes associated with responsible citizenship.
I. Be creative in one or more fields of endeavor.
J. Understand the opportunities open to him for preparing himself for a productive life and should enable him to take full advantage of these opportunities. (Wiseburn School District 1973, p. 2).

As might be expected, such a listing does not specifically consider the needs of gifted pupils. However, a careful reading indicates a major commitment to the recognition of individual differences among the pupils. It is interesting to note the obvious conflict between this recognition of individual differences on the part of a district, and the desire of teachers to minimize individual differences for the sake of efficient classroom management.

In a survey of the Wiseburn community, teachers and older students identified mastery of the basic skills as the highest priority; community and parents identified positive attitude toward the learning process as the second highest priority; and pupils were more concerned with vocational information. At the other end of the scale, the lowest ranking priority for parents and pupils was multicultural/multiethnic education, and for teachers it was creativity. There is a discrepancy between teacher and community priorities of educational goals--a discrepancy that must be addressed by the school district.

In addition to setting educational goals, districts must consider implicit goals, such as the maintenance of daily attendance. Because many funding formulas are based on ADA, it behooves a district to consider activities which will keep children in school. These types of concerns place school districts in the position of offering special programs for special populations in order to maintain enrollment. However, these special programs are generally not economical and tend to counteract their purpose of

increasing available money by maintaining attendance.

School districts also must contend with accommodating changes in procedure, including such changes as the addition of special education for the gifted.

Bidwell described this method as arising from "the dual but overlapping responsibility of school offices to a clientele and to a public constituency" which requires:

> The maintenance of sufficient latitude vis a vis the public constituency and its agent, the board of education, for the exercise of professional judgments, regarding first, what kinds of outcomes best serve the students and the constituency and, second, what procedures are best adapted to these ends. This problem is generic to professionally staffed organizations--to prevent client demands from defining client welfare, compounded by the necessity, as an arm of the government, to remain responsive to the controlling constituency. (1965, p. 1012, emphasis added)

In analyzing this consideration, Boyd recognized that, although an unusually high degree of ambiguity surrounds educational ends and means and impedes "rational decision making, planning, and evaluation, it is necessary in the facilitation of compromise and the avoidance of ethnocultural conflict" (1978, p 260).

These observations suggest that school districts, while endorsing lofty programmatic goals for gifted education, will not on a rational basis allocate the means necessary to accomplish the ends. This should not be considered a pejorative comment. In all probability, as will be discussed, empirically verifiable means are unavailable to accomplish the ends.

Funding Agencies. The last, but not least, constituency with interest in gifted programs is the legislative group. This constituency provides operating authority for, and typically, some additional funding of, gifted programs. To illustrate the role of legislatures, the programs in Illinois and California will be discussed briefly.

The Illinois state program for the gifted, described by Gallagher (1975, p. 298), contained five components: support for special services as determined by local needs, centers for demonstration of excellent gifted educational programs, innovative curriculum development, staff training support, and administrative leadership at the state level. The state legislature focused primarily on the processes and funding of the programs, while leaving the determination of specific results for the gifted to the local school districts.

Evaluation of the Illinois program found:

> that small school districts had a difficult time providing adequate services for their talented students but that medium and large districts could and, in fact, did establish medium or high quality programs that included more productive and stimulating classroom activities and a positive and appropriate climate for learning. (p. 300, emphasis added)

A report of the Joint Legislative Audit Committee of the California Legislature (1978) described this state's gifted pupil program:

> California's Mentally Gifted Minors (MGM) program, initially authorized by Chapter 888, Statutes of 1961, provides funding for school districts to offer educational programs suited to the abilities of gifted students. Under program regulations, districts that choose to participate must provide activities which are "qualitatively different" from regular classes. They may be offered through a range of program options including, for example, placement in advanced grades or classes, supplemental activities within the regular classroom or special "pull-out" activities organized for gifted pupils. (p. 6)

Again, the specific expectations of the gifted program were left to the local school district.

Supplementary information in the committee's report revealed the 1977-78 funding levels for identification of gifted pupils to be $44 per identified pupil, and for program activities to be $88 per pupil (p. 22). The report also identified three specific problems of gifted programs: excess enrollment, overreliance on I.Q. tests for identification, and funds being disproportionately allocated to high revenue districts (1978, cover page).

Summary. The preceding discussion was intended to demonstrate the necessity of defining goals for gifted pupil programs in terms of the interested audiences and their particular needs. These audiences are: pupils, who have insatiable curiosity, but needs for emotional support because of their "being different"; parents, who want the best for their children, and also need information about reasonable expectations for their gifted children's cognitive, affective, and psychomotor domains; teachers, who want to accommodate gifted pupils without slighting the basic responsibility of managing a classroom for instructional purposes; school districts, which have a vested interest to provide each child the opportunity for maximum possible development, but must view gifted programs in terms of the best possible compromise between the demands of a highly vocal constituency (parents of gifted children) and the realities of budgetary, legal, and curricular restraints; and funding agencies, which need to demonstrate an awareness of societal expectations with respect to this identified resource.

Goals

The identification of goals might begin with the classic analysis by Hollingsworth (1942). She identified five problem areas of gifted adolescents: to find sufficient hard and interesting work at school, to learn to suffer fools gladly, to avoid the development of negative attitudes toward authority, to keep from becoming hermits, and to avoid forming habits of extreme chicanery. Four of the five areas could easily be classified as affective. Although Hollingsworth investigated extremely bright youngsters (above 180 I.Q.), in all probability the identified problem areas apply to all pupils with above average mental abilities.

Gowan, in a review of the gifted child movement, argued for a cognitive focus. He stated:

> ...a gifted child, as one who has an arbitrary intelligence quotient, is no longer viable. In the first place, a definition depending upon an arbitrary level of I.Q. is obviously superficial.

> In the second place, giftedness represents only potentiality: the major variable is creativity. We should redefine giftedness therefore as the potential to become verbally creative, and talentedness as the potential to become creative in other ways, such as in mathematics or the performing arts. (Gowan 1977, p. 21)

These differences in the goals emphasized (one focusing on the affective domain, the other on achievement potential in the cognitive domain) could produce markedly different program structures. The next section discusses curriculum and how the selection of goal-derived program objectives are influenced.

Curriculum

As used here, a curriculum is considered to be the aggregated course of study and instructional procedures that operate within a school setting to produce desired changes in pupil behavior. Two approaches are generally advocated for gifted children: acceleration or enrichment. Acceleration, as a procedure, has received renewed interest as a result of the Study of Mathematically Precocious Youths at Johns Hopkins University in Baltimore. Stanley (1977) argued persuasively that optional selection among a variety "of accelerative possibilities...is far superior to so-called academic enrichment" (p. 95). Stanley also wrote, "We have found that stimulation by one's intellectual peers within a homogeneously grouped class, which is fast-paced by the teacher, produces astoundingly good results for about half the students enrolled" (p. 95).

From Hollingsworth comes support for this argument in the following observation:

> ...a child of 140 I.Q. can master all the mental work provided in the elementary school, as ordinarily established, in half the time allowed; and a child of 170 I.Q. can do all the studies required, with top marks, in about one-fourth of the time. (1942, p. 287)

These findings would suggest that if the goal of the program is to develop creative potential, then the development of compressed schedules (the content of two to four years presented in a year's time) to accelerate gifted pupils through the typical public school program to allow for early entry into college or technical schools would be desirable. Certainly, such a program has many advantages, and again quoting Stanley, "We do not know of a single careful study of actual accelerants that has shown acceleration not to be beneficial, though armchair articles against it abound" (p. 94).

Although not wanting to be classified as an "armchair critic," it must be obvious that acceleration has some difficulties; otherwise, it would be the preferred curriculum for gifted pupils. While accepting the assumption of demonstrable benefits for the pupils, the costs associated with such a program are unjustifiable in the public sector. Following the analysis of Burt, with respect to the relative weight of "excessively bright" vis a vis "backward" pupils, it would seem the average class of accelerated pupils should be approximately six as compared to an average classload of 30 to 36. This would raise the immediate cost of schooling from an approximate $2,000 per pupil to $12,000 per pupil. This amount would go even higher when one adds in the cost to identify gifted pupils and then to transport them to a teaching station in

order to accumulate the requisite number for a "homogeneously grouped classroom."

In addition to the cost of such a program, legal implications, too, should be considered. For example, the "Larry P." case in San Francisco found that individually administered intelligence tests as a screening device caused minorities to be overrepresented in classes for the mentally retarded. It seems to be only a matter of time until a similar suit is filed challenging the "underrepresentation" of minorities in gifted programs.

The second major, although somewhat amorphous, procedure is "enrichment." Arguments advanced favoring this kind of program usually center on the emotional growth of the pupil and the necessity to learn "to suffer fools gladly." Although I have no empirical data to support such a conclusion, I believe the reason for the popularity of enriched programs is the general feeling that "something should be done for the gifted pupils," and the fear that homogeneous grouping would lead to "elitism." Irrespective of the reason, "enrichment" is the preponderant method of instruction for gifted pupils and, as such, places severe limitations on program goals. The previously discussed report from the California Legislative Audit Committee found the highest ranked types of gifted programs to be: Supplemental Activities in Regular Classroom; Special Counseling, Instructional Activities, or Seminars; Special Classes for Part of School Day; Advanced Grades or Classes (typically Advanced Placement for College Credit).
The lowest ranked type of program (eighth) was Special Classes for Full Day (1978, p. 46).
While the "Advanced Grades or Classes" might be offered as a type of acceleration, it is typically a compression of seven years (Grades 7-13) into six years (Grades 7-12) in specific subject areas. Further, advanced placement programs are generally available to a much broader group of students (perhaps 10-12%) than those normally classified as gifted. As a consequence, it is argued that the enrichment activity is the mode of gifted instruction.

Although the types of enrichment programs are legion, Stanley provides an interesting summary as follows:

> Busy Work: It consists of having them (the bright students) do a great deal more of the subject in which they are already superb, but at the same level as the class they have already surpassed.
> Irrelevant Academic Enrichment: Offering all high I.Q. youths a special academic course such as a high-level social studies or essentially nonacademic work such as games (e.g., chess) or creative training largely divorced from subject matter.
> Cultural Enrichment. Providing certain "cultural" experiences that go beyond the usual school curriculum and therefore do not promote later boredom. Examples are music appreciation, performing arts, and foreign languages such as Latin and Greek...
> Relevant Academic: It is likely to be both the best short-term method and one of the worst long-term ones. Suppose, for instance, that an excellent, forward-looking school system provides a splendid modern mathematics curriculum for the upper 10 percent of its students from kindergarten through the seventh grade, and then in the eighth grade these students begin a regular algebra I course. How bored and frustrated they are almost sure to be! It is not educationally or psychologically sound to dump these highly enriched students into the mainstream, and yet that kind of situation often occurs. Only if the kindergarten through twelfth-grade curriculum

> is considered can this failure of articulation be prevented. Even then, a superb thirteen-year mathematics program without strong provisions for college credit would merely defer the boredom and frustration until the college years. (1977, pp. 91-2, emphasis added)

A careful reading of this last position suggests that if the caveat with respect to articulation is respected, this proposed enrichment activity is in reality a form of acceleration by compression (14 years into 13 years). The procedure would require special classes, but, because the proportion of students would be perhaps 10 percent, the concerns of developing an "elitist" group would not be appropriate. (I may be overly sensitive to this charge because of a recent experience. I was collecting data on the likes and dislikes of gifted pupils for school subjects and requested permission to interview a group of identified students. I was granted permission to interview the students, but was told that I couldn't discuss "gifted" programs because many of the parents did not want their children to know they were identified as gifted.)

This kind of program, however, would not meet Hollingsworth's definition of a compressed curriculum (1942, p. 287). The 14 years into 13 years would result in an approximately 9 percent compression, while Hollingsworth argued for a 34 to 50 percent compression. It is possible that an articulated college placement program, as described by Stanley, coupled with judicious employment of grade level "skipping" might be the most satisfying compromise in public school systems.

The arguments for skipping grades are that: (a) the curriculum would be consistent with the general purposes of public education, (b) the goal would be acceptable to all audiences, and, perhaps most important, (c) instructional materials and qualified teachers would be generally available to accomplish the objectives. A further argument for most school districts is that it would not be unreasonable to identify sufficient students to constitute regularly scheduled classes of near average enrollment which would mitigate the cost of such classes.

Arguments against such a procedure are: (a) the previously mentioned charges of developing elitists, (b) methods of identification particularly in concert with racial discrimination, and (c) the requirement of some funding agencies that programs for gifted must be "qualitatively different from the regular school program" (California Administrative Code, Section 3831 d).

"Busy Work" should be rejected as a program alternative even though it does enjoy use, usually out of sheer desperation on the part of the teacher within the school system.

"Irrelevant Academic Achievement" is less easy to dismiss. A school situation where higher level "learning how to learn" procedures such as creativity training or critical thinking are not formally incorporated into the curriculum would provide the possibility of utilizing an academic enrichment program for gifted pupils as a development situation for these programs. Implicit in such a procedure is the assumption that successful programs would with time permeate the schoolwide curriculum and new programs for the gifted would have to be generated. (See Critical Thinking Processes published by Los Angeles City Schools (1975), and Production of Unique Communication (Smith 1979) as examples of this type of effort.)

The advantages of these types of enrichment programs, in terms of Hollingsworth's identified goals, are: the opportunity to engage in hard and challenging work on a partially independent basis and an environment where

gifted pupils can work with their intellectual peers at least part-time, which would partially alleviate the "hermit" tendency. Other advantages of enrichment programs were identified by Smith (1978a, 1978b). Using teacher, administrator, and parent interviews, I analyzed both elementary and junior high programs and concluded that the advantages of enrichment programs are: To provide positive visibility for the school in the community; to serve as an example for within-school activities; to develop parental involvement in school activities; to assist gifted pupils in achieving their academic potential and developing school related self-concepts.

Specific disadvantages include:

1. Lack of financial support particularly in terms of allocated staff time to develop and carry out the program. This was evident from an analysis of the additional teaching activities needed for the gifted program as compared to normal teaching activities.
2. The cumulative time expenditures devoted to the program amounted to a voluntary contribution on the part of parents, teachers, and administrators of $650 to $1,370 per pupil.
   A large amount of effort and time expenditure was expected of the involved pupils. These programs were based on a within school time allocation of 200 minutes per week; however, the nature of the programs, i.e., production of research reports and literary efforts, required many additional work hours and weekend effort.
3. Tendency of identified pupils to develop an "elitist" attitude. This was detrimental to both the morale of the school student body and the gifted pupils' adjustment to the school.

Finding individuals--teachers, parents, and administrators--willing and able to volunteer the enormous amounts of time on a continuing basis to ensure the success of this type of program is a difficult problem, which is compounded by the lack of curriculum materials. This lack is, in my judgment, the major obstacle in the development of an articulated curriculum across time and grade level. This deficiency prevents the development of a well-designed evaluation of agreed upon goal related objectives.

A third general approach to programs for gifted children is independent study. This type of program, when conducted in a school setting, compounds all of the difficulties of the above described "part-time" programs with none of the advantages. Independent study programs can be spectacularly successful when the pupil has access to guidance and review by an expert in the particular field of study. However, I submit that classroom teachers have neither the time, nor in most classes the expertise, to function in this tutorial manner.

Given the lack of specificity in the information with respect to curriculum, it seems fitting to quote Gowan:

> We still cannot answer the following basic questions for lack of proper research and/or theory:
> 1. How can we intervene educationally to promote more creative actualized giftedness adults?
> 2. What should differentiated curricula for the gifted be like?
> 3. How should programs for educating gifted children be administered, and what cost-benefit ratios should be sought?

4. What are the specific environmental details favoring or retarding the development of creativity in gifted children? (1977, p. 18)

Summary of Curricular Offerings

On a logical, not theoretical, basis, the foregoing discussion was intended to present two possible curricula for the public school. Taken into consideration were: the teacher's needs to give highest priority to classroom management for group instruction, administrative priorities in terms of expenditure control, and the public expectation of the function of schools to provide instruction in literacy skills.

1. Advanced Placement Programs in the subject areas which are available to the top 10-12 percent of the students. If the gifted children were allowed to accelerate through these types of programs on a rational basis, this should provide an environment to satisfy the Hollingsworth criterion of "sufficient hard and/or interesting work." In addition, with proper consideration in the selection of classroom managers, these types of programs would provide some movement toward "learning how to suffer fools gladly," "developing reasonable attitudes toward authority," and becoming somewhat "more social" (at least among peers).

2. Specific Product-Oriented Programs with these characteristics: (a) heavy cognitive loading, (b) articulated across grade levels, (c) conducted at least partially under the purview of the school, and (d) sufficiently attractive to the community to receive support both in terms of costs (volunteered time) and psychological support (the worthiness of the product). The products of these programs could include such items as school or community histories, collections of original short stories, poems, etc., school science fair entries, school or community environmental studies. These types of programs, while not as elegant as the Advanced Placement Program in terms of acceleration, should, with careful selection of the project leader, provide a setting for movement toward the affective components of the Hollingsworth goals.

Evaluation

Evaluation has as its purpose the delineation, collection, and presentation of information to assist in judging which among several possible courses of action should be pursued. In ongoing programs, evaluation can provide information for four necessary decisions:

1. Which of the several possible goals should be adopted for the program?

2. Which particular instructional plan should be used to enable the students to best achieve the goal-derived objectives, given the constraints of teachers, time, curricular materials, and facilities?

3. Is the developed procedure operating as planned? If not, what modifications should be made?

4. Did the program achieve its stated objectives? Were there unintended results that should be included in considerations of program replication?

Attention to these four classes of questions will allow the local school decision makers to: choose goals that best meet the requirements of the local school community, select instructional strategies which most efficiently

employ available resources (teachers, materials, space), conduct on-site monitoring to ensure the adoption of instructional strategies, and determine the overall worth of the local school program. By maintaining records of how these decisions are developed, the base information for cost benefit analysis can be collected.

A major concern of the evaluation activity is a clear definition of the goals and derived objectives of the program. To start, one might consider the desired end products of gifted education and relate applicable aspects of the goals to achieveable school activities. Examples of these desired end products abound; for example, Taylor and Barron (1963, pp. 385-86) identified these traits as being characteristic of creative scientists:

1. A high degree of autonomy, self-sufficiency, self-direction
2. A preference for mental manipulations involving things rather than people; a somewhat distant or detached attitude in interpersonal relations, and a preference for intellectually challenging situations rather than socially challenging ones
3. High ego strength and emotional stability
4. A liking for method, precision, exactness
5. A preference for such defense mechanisms as repression and isolation in dealing with affect and instinctual energies
6. A high degree of personal dominance but a dislike for personally toned controversy
7. A high degree of control of impulse, amounting almost to overcontrol: relatively little talkativeness, gregariousness, impulsiveness
8. A liking for abstract thinking, with considerable tolerance of cognitive ambiguity
9. Marked independence of judgment, rejection of group pressures toward conformity in thinking
10. Superior general intelligence
11. An early, very broad interest in intellectual activities
12. A drive toward comprehensiveness and elegance in explanation
13. A special interest in the kind of "wagering" which involves pitting oneself against uncertain circumstances in which one's own effort can be the deciding factor.

Although it is obvious that not all of these apply, it would seem that careful consideration of 1, 2, 8, 11, 12, and 13 would describe a potentially useful list of objectives for school-related programs for gifted children.

A somewhat similar list of desired end products for gifted education was made by Dale (1972, pp. 66-9) in characterizing a critical reader as: (a) independent, problem-centered; (b) analytical and judgmental; (c) based on a stubborn effort to get at the truth; (d) creative, imaginative, and nonconformist; (e) associated with the best minds of all generations; (f) involved and participatory; (g) sensitive to words and vocabulary; and (h) concerned with remembering, not forgetting. (For examples of published efforts to expand these types of characterizations into program evaluations, see the American Association for the Advancement of Science (Miscellaneous Publication 68-4), Science--A Process Approach and Evaluation Model and Its Application, Washington, D.C., 1968; and J.C. Hoatz, S. Rosenfield, and T.J. Telenbaum, Measurement and Evaluation of the Creative and Problem Solving Abilities of Gifted Elementary School Children: Validation of a Creative Thinking and Problem Solving Model, Fordham University, 1977.)

The major concern regarding evaluation is the derivation of measurable objectives from the goals of the program. As specified, a goal is timeless in its accomplishment, a lodestar, if you please; objectives are bound by time and designed to be accomplished. Further, there is an implicit assumption that the accomplishment of the objective will assist the individual in the ultimate attainment of the goal.

To illustrate, suppose the goal of a program for gifted students in grades K-12 would be: "To assist each student in attaining his/her ultimate creative potential." On the basis of analysis of the characterization of a creative scientist, particular objectives might be specified that should be accomplished by the third grade, for example, "Recognition of assumptions, or distinction between relevant and irrelevant premises for decisions." Instructional programs are then devised to accomplish the objectives.

A series of questions could and should be raised in regard to devising instructional programs. The questions should center around the assumption of the necessity and sufficiency of the objective accomplishment vis a vis the goal attainment questions such as "Is the objective necessary?" "What are the necessary prerequisite objectives?" "What objectives should follow?" "In what sequence?"

These questions are presented to reinforce Gowan's observation (1977, p. 18) that we really do not know how to teach creativity and, as a result, we must be prepared to design an objective sequence on a logical basis.

A second set of questions focuses on the validity and reliability of the measures selected to portray the objectives. Because the objectives of gifted education tend to be of the higher levels of cognitive domain and the affective domain, the development of measurement instruments with demonstrable construct validity is exceedingly difficult. This paucity of instruments requires that both the objectives specified and measurements selected have face validity. That is, the objectives and instruments must on their faces appear to be strongly related to the goal.

A final series of questions relates to the efficacy of the particular course of instruction. Suppose you carry out the treatment designed to attain the objective, and determine that the objective has been accomplished? Can you be sure it was the instruction that caused the accomplishment or are there other, equally plausible explanations? (For gifted children, the alternative explanations are usually general ability, prior experience, or curiosity.)

This final concern, which can be ameliorated to a certain extent by careful design considerations, should serve as a warning to avoid grandiose claims of success.

Summary of Evaluation

In summary, the availability of evaluation instruments places a restriction on conducting gifted programs. It is necessary to conduct a program to determine if the expectations are logically related to the goals. This in turn inevitably leads to a careful consideration of the expressed needs of each of the participants and audiences of the gifted program.

While measures of the cognitive aspects of pupil achievement are the centerpiece of school-related evaluations, it has been the thesis of this presentation that affective components share in the importance. In addition, it was pointed out that each of the sets of participants have identifiab e objectives which must be addressed within the context of the evaluation. At the risk of oversimplification, the concerns of the participants are:

Students: A structure which provides for and encourages independent pursuit of interesting intellectual exercises.

Parents: Knowledge of gifted pupils' expectations and achievements, particularly on a comparative basis.

School districts: Effects of the gifted program on the total instructional program.

Funding agencies: The entire range of cognitive and affective (and sometimes psychomotor) objectives based on some ideal description of results such as those of Hollingsworth or Dale.

Interaction

The general argument of this paper has been to define a set of goals, available instructional procedures, and appropriate evaluation questions for a gifted pupil program capable of functioning within the school environment. The information presented in this paper suggests an umbrella goal for gifted programs, such as, "To assist each gifted pupil to attain peak creative potential." As this general goal is further specified and stated in terms of attainable objectives, it becomes apparent that specific objectives and means for accomplishing them cannot be directly related to the overall goal. As a consequence, process objectives must be either implicitly or explicitly generated. The following process objectives are suggested: For students, providing sufficient work of an appropriate nature to keep gifted students interested in school; for parents, providing activities and information which enable them to be involved in and judge both program and pupil development; for teachers, providing support (both psychological and physical) for the initiation and maintenance of a potentially more demanding work effort; for school boards, providing evidence that, while the needs of the gifted pupils are being addressed, it is not at the expense of the remainder of the student population; for funding agencies, providing evidence of well-designed and smoothly operated programs which progress toward stated goals.

Curriculum

Two general types of programs are offered which might be capable of satisfying these goals and objectives.

The most desirable would seem to be a carefully designed accelerated program through an advanced placement sequence in which it would be possible for pupils, at age 14, to end public schooling with a year of college credit.

The second would be a modified enriched program dealing with relevant academic material, such as critical thinking, in an articulated K 12 sequence. A major function of this type of program would be to provide some time for gifted pupils to be stimulated by inceraction with their intellectual peers.

Evaluation and Conclusion

While it is undoubtedly necessary to identify and measure cognitive processes in order to assess progress toward the attainment of stated goals and objectives, it is suggested that judgments of a gifted program's worth could be better determined by careful analysis of the participants' progress toward their identified goals and objectives.

Finally, it is suggested that careful consideration of these three interrelated topics (goals, instruction, and evaluation) will result in gifted programs functioning in public school settings. They will be modest in promise, scope, and accomplishment, but they will be successful in that they will continue to function and be supported by their constituencies.

REFERENCES

Bidwell, C. "The School as a Formal Organization." In Handbook of Organizations, edited by J.G. March. Chicago: Rand McNally, 1965.

Boyd, W.L. "The Study of Educational Policy and Politics: Much Ado About Nothing?" Teachers College Record 80, 2 (December 1978):269-71.

Broudy, H.S. "The Search for a Science of Education." Phi Delta Kappan (December 1978):104-11.

Burt, C. The Gifted Child. New York: Holstead Press, 1975.

California State Legislature. California's Policies for Education of Gifted Pupils Need Legislative Redefinition (joint legislative audit committee report 820). Scaramento, Calif : Office of the Auditor General, 1978.

Collis, H. "Bright Children and Their Parents." The Practitioner (1972):29-32.

Dale, E. Building a Learning Environment. Bloomington, Ind.: Phi Delta Kappa, 1972.

Dreeben, R. "The School as a Workplace." In Second Handbook of Research on Teaching. Chicago: Rand McNally, 1973.

Gallagher, J.J. Teaching the Gifted Child. Boston: Allyn and Bacon, 1975.

Ginsberg, G., and Harrison, L.H. How to Help Your Gifted Child. New York: Moraret Press, 1977.

Gowan, J.C. "Background and History of the Gifted Child Movement." In The Gifted and Creative. A Fifty-year Perspective, edited by J. Stanley, W. George, and C. Solano. Baltimore, Md.: Johns Hopkins University Press, 1977.

Hollingsworth, L.S. Children Above 180 IQ. New York: World Book Company, 1942.

Los Angeles City School District, Instructional Planning Division. Programs for Gifted Section: Critical Thinking Processes. Los Angeles: Los Angeles Unified School District, 1975.

Marland, S.P. Jr. Education of the Gifted and Talented, vol. 1. Washington, D.C.: U.S. Office of Education, Department of Health, Education, and Welfare, 1971.

Smith, R.A. Cost Benefit Analysis, Junior High School. Report prepared for the Los Angeles Unified School District, Program for Gifted Section, 1978a.

_____. Cost Benefit Analysis, Elementary School. Report prepared for the Los Angeles Unified School District, Program for the Gifted Section, 1978b.

_____. Production of Unique Communication. Program proposal prepared for the Los Angeles Unified School District, Program for Gifted Section, 1979.

Stanley, J.C. "Rationale of the Study of Mathematically Precocious Youth

(SMPY) During Its First Five Years of Promoting Educational Acceleration." In The Gifted and Creative: A Fifty-year Perspective, edited by J. Stanley, W. George, and C. Solano. Baltimore, Md.: Johns Hopkins University Press, 1977.

Taylor, C.W., and Barron, F. "A Look Ahead: Reflections of the Conference Participants and the Editors." In Scientific Creativity: Its Recognition and Development. New York: John Wiley and Sons, 1963.

Today's Education. (February/March 1980)

Torrance, E.P. Rewarding Creative Behavior. Englewood Cliffs, N.J.: Prentice-Hall, 1965.

Toynbee, A. "Is America Neglecting Her Creative Talents?" In Creativity Across Education, edited by C. Taylor. Ogden, Utah: University of Utah Press, 1968.

Wachter, P. The Development and Application of a Procedure for Ongoing Evaluation of Goals of a District Programs for Gifted Students: An Exploratory Study. Unpublished doctoral dissertation, University of Southern California, Los Angeles, 1980.

Wiseburn School District. Newsletter 15 (December 1973):4